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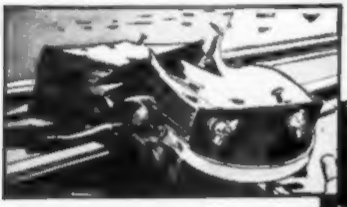
SEE PAGE 48
RAISES SUNKEN TREASURE

Suffocation Clawed Their Throats

Quick Wits Save Cave-In Victims in Old Gold Mine

"Two miners were entombed by a cave-in at the end of a drift 800 feet under ground," writes Mining Engineer P. Donald Ziemke of 2032 W. Keefe Ave., Milwaukee, Wis.



"We found the push-down generator (which furnishes spark for the charge) wrecked. In the excitement some one had pushed a mine car over it.

"A huge boulder lay in the path of the rescuers. We had to blast. We worked furiously... minutes might mean life or death. And then, with the blast ready...

"But the shift boss kept his head. He ran to the dynamite magazine, where we always kept a flashlight, and brought it out on the double. He unscrewed the lens and bulb, flipped on the switch. Then he plunged the ignition wires in... and—

"The blast let go... the boulder was shattered... we got the men out, and not a second too soon. They were up to their armpits in water, with the air so bad their miner's light had gone out. No doubt about it, *fresh* DATED 'Eveready' batteries saved these two lives."

Signed P. Donald Ziemke

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by S. J. E.
(NAME AND ADDRESS SENT UPON REQUEST)

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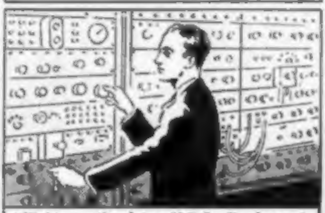

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NEXT MONTH

In addition to many interesting and novel workshop projects that will provide ample outlet for your skill with tools, readers will find many general features of an interesting and informative nature.

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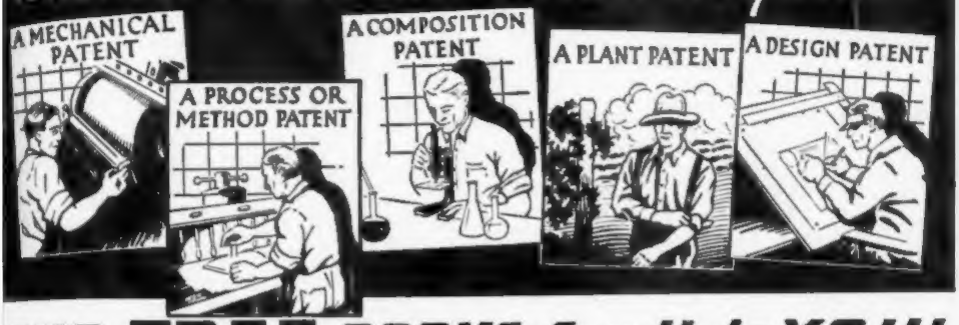

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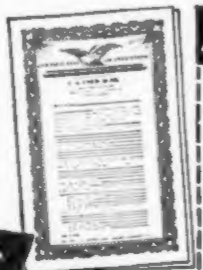

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IS TELEVISION READY?

I have heard a lot about television being "just around the corner." Is television ready for public use, and are the pictures as good as the movies? When can we expect to get television programs on a regular schedule like radio?—Robert Jordan, Detroit, Mich.

Television today is very close to that mythical "corner" and will be released for public use when the manufacturers are ready. A few weeks ago a television demonstration was given in New York for the benefit of radio amateurs. The image produced compared favorably with that of the average home movie projector, with the exception of its size, it being considerably smaller. The demonstration was a complete success and showed clearly that television is an accomplished fact, even though it is not in the hands of the public.

"B" BATTERIES WEAR OUT RAPIDLY

I have a battery operated radio receiver and the "B" batteries never last more than two months. I have heard that they should last several months. Do you think something is wrong with the set?—Tom Tracy, Salt Lake City, U.

If you use heavy duty batteries, and they last but two months, something certainly is wrong, but it may not be easily corrected. It may be that you are using batteries on a set which should have a power supply. If the tubes draw too many milliamperes, batteries never will prove efficient. If the set was not designed for battery use, you may find a bleeder connected across the "B" input, which would in itself place a continual load on the batteries. If this is the case, connect a switch in series with the batteries so that when the set is not in operation, they can be disconnected. This will eliminate power consumption when the receiver is not in use.

INSTALLING TONE CONTROL

My receiver has no tone control. Is there some easy way I can install one? The receiver has six tubes.—William Fox, Austin, Texas.

A simple tone control applicable to almost every set consists of a 200,000-ohm potentiometer in series with a 0.1 mf. capacitor. Connect one lead from the capacitor to the plate of the output tube and the lead from the potentiometer to the chassis. If the set uses two output tubes, connect leads to plate of each tube.

MAKING BLACK PAINT

Is there any simple way of making black paint which will have a dull finish? I need the kind which will dry quickly —Frank Scott, Louisville, Ky.

An easily made paint consists of an old phonograph record dissolved in alcohol. To make it, break up the record into very small pieces and place them in a jar of alcohol. Let it stand over night before using.

REMOVING WALL PAPER

Is there any easy method of removing wall paper after it has been in place for a number of years?—J. E. Adams, Portland, Oregon.

The system used most often for the removal of old wall paper is to soak it for a few minutes with warm water before attempting to remove it. When the glue has softened sufficiently the paper can be pulled off. When the paper is too fragile, it will be necessary to scrape it off with a scraper or a putty knife. A small quantity of baking soda dissolved in the water may speed the paper's removal.

MAKING A SIMPLE HYGROMETER

Is there any simple method of making a hygrometer for home use? I have heard they can be made by saturating paper with some solution.—Walter Hendricks, Des Moines, Iowa.

Paper hygrometers are made by saturating blotting paper with a liquid made as follows:

Cobalt chloride	1 ounce
Sodium chloride	½ ounce
Calcium chloride	75 grains
Acacia	½ ounce
Water	3 ounces

The amount of moisture in the atmosphere will be indicated by the color of the paper. Following are the colors and their indication:

Rose red	rain
Pale blue	very moist
Bluish red	moist
Lavender blue	nearly dry
Blue	very dry

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Chips from the

Proving that MM amateur aviation fans CAN build good airplanes, this three-passenger aircraft was constructed by Robert F. Stryker and Frank Gordon, of Red Bluff, California.

IN THE December issue of MM we featured a short article—"Are Home-Built Planes Safe?"—which concluded by asking readers to send in letters and photographs of airplanes they had constructed. The response was very gratifying and proved that many MM readers have kept up their interest in amateur aviation during the past few years despite the Bureau of Air Commerce regulations which prohibit the flying of home-built planes in all but a few states.

• • •

One of the letters received was from Robert F. Stryker, of Red Bluff, Calif., and it contained a photo of a home-built plane that will certainly arouse the interest of many MM readers. The letter, which was awarded this month's first prize of $5, reads as follows:

Dear Editor:

I am enclosing a photo of an airplane which was built sometime ago by Frank Gordon, a friend, and myself. It is a three-place high wing monoplane, powered by a Hispano-Suiza engine.

Every part for this plane was designed on paper before construction was started. When completed, the plane was test flown by a local pilot and no "bugs" (faults) were found. In fact, not even the wing or tail settings had to be changed, the pilot reporting that the plane flew "hands off" the controls

We got an "R" license for the plane, but when that ran out we could not secure a commercial license. I have part of a plane nearly finished now, but what is the use of spending money and time completing it when the most I can hope for under present regulations is a permit to fly it for one year?

Robert F Stryker.

We sympathize with reader Stryker and all other home-built plane fans. It certainly seems unjust to withhold a plane license after a plane has proved its airworthiness by making numerous flights, safely, during an entire year. We will have more to say on the subject of amateur aviation in a future issue of MM.

Midget racers still rank high with a great number of readers and a letter and photo describing one built by E. R. Harford, of Middletown, N. Y., was awarded a $3 prize. The letter reads:

Dear Editor:

Here is a snapshot of a Midget Miller racer I constructed from MM plans, with the exception of the radiator streamlining. A washing machine motor supplies the power, being mounted at the rear of the chassis. E. R. Harford.

Harford's midget racer is a fine looking one and we compliment him for a job well done.

• • •

Trailers are beginning to intrigue MM craftsmen in increasing numbers and a letter and photo describing a home-built "rolling home" won a $3 award in this month's Workbench contest for Robert C. Vierling, of Webster Groves, Mo., whose winning letter reads:

Dear Editor:

I am enclosing a snapshot of my house trailer, which I built in about five months spare time at a cost of $230. It is 15 feet long and has ample headroom for a six-footer. Weight is about 1700 pounds.

This is the first home built project I ever attempted, but I have studied many of your "how to build" books

Proudly, the son of E. R. Harford, of Middletown, N. Y., drives the Midget Miller racer which his Dad built from MM plans. Top—A three-quarter view showing the car's trim lines.

Editor's Workbench

and the knowledge gained certainly helped me when I constructed the trailer.

Robert C. Vierling

There are plenty of happy days ahead for reader Vierling and other MM craftsmen who have constructed trailers. If you are interested in trailers, secure a copy of "How To Build Trailers" from your local newsstand or direct from MM at Greenwich, Conn. The cost per copy is only 50c.

* * *

A letter received from Max Lerner, of Elk River, Minn., was also awarded a $3 prize. His letter reads.

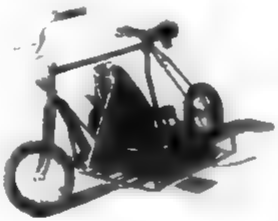
Dear Editor:

Enclosed is a photo of a midget motorbike which was constructed by a friend and myself. "Wide open," the powered bike speeds along at 22 m. p. h.

The frame is constructed of welded bicycle tubing and is mounted on 12-inch wheels. Power is supplied by a 3/4-horsepower washing machine motor.

Max Lerner

We are willing to wager that Lerner's novel motorbike creates considerable interest whenever he scoots around town on it.



Max Lerner's home-built motorbike

* * *

James M. Calkins, Jr., of Wakeman, Ohio, is another MM craftsman whose letter and photo describing a midget racer was awarded a $3 prize. He writes:

Dear Editor:

Here is a photo of my son Donald with a midget car I constructed for him. The car has a 56-inch wheelbase a 28-inch tread and is equipped with real air-filled tires. A washing machine motor provides plenty of power to climb steep hills as well as a top speed of about 15 m.p.h.

A belt tightener, operated by the feet, serves as a clutch. A small hand brake stops the car within a few feet when necessary.

James M. Calkins, Jr.

Another lucky boy whose father built a midget racer for him is Donald, son of James M. Calkins, of Wakeman, Ohio. Note how belt drive engages the washing machine motor power unit.

Young Donald must surely be the most popular boy in his neighborhood when he drives up in his midget car.

* * *

We received a letter from an MM reader in Leeds, England, which may interest photography fans. The letter reads:

Dear Editor:

I have long intended to write to you, but neglected to do so until I read your special photography section in the current issue. I think it will be an innovation approved by many of your readers.

In England, MODERN MECHANIX is unique. We have nothing to compare with it and it is appreciated by many of my fellow countrymen who are interested in science, mechanics and photography.

I would like to correspond with American MM readers who, like myself, are keenly interested in photography. My address is 8 Moorfield St., Leeds 12, England.

Ronald H. Downs

Like reader Downs, many other MM photo fans have complimented us on our Modern Photography Section and we assure them that the section will be continued. We are certain that some American camera enthusiasts will be glad to contact Mr. Downs and exchange ideas on their favorite subject.

* * *

Every reader of MODERN MECHANIX is invited to send in photos and letters describing completed workshop projects. We prefer to use photos of projects constructed from MM plans, but we assure readers that consideration will be given to all photos submitted to the Workbench.

Commuting his first home-built project, this trailer home was constructed by Robert C. Vierling. Complete, the trailer weighs 1,700 pounds.

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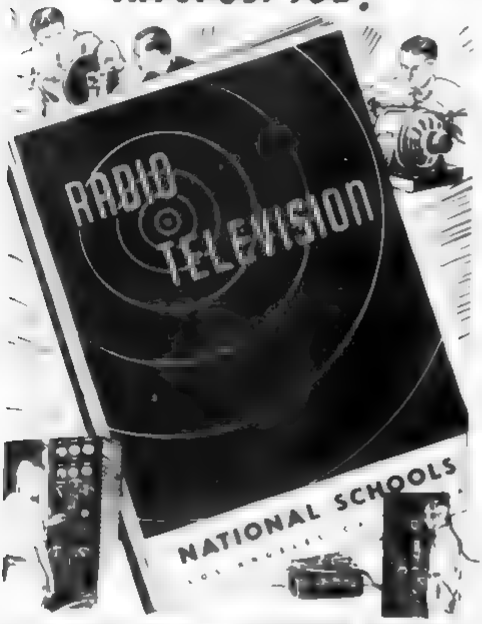

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Volume XIX
No. 5

MODERN MECHANIX

MARCH
1938

W. H. FAWCETT, Publisher

HELIUM METHOD RAISES SUNKEN TREASURE

HUGE fortunes in gold and gems lying in the holds of sunken ships are no longer beyond recovery now that a record-breaking descent of 420 feet has proved salvaging sunken treasures safe and practicable.

Gold-laden ships, previously barricaded by unconquerable depths, were literally swept into shallow water by the record depth Max Nohl reached recently preparatory to salvage efforts on the S. S. *Lusitania* and *Merida*.

Nohl's record descent was 108 feet deeper than the torpedoed Cunard liner *Lusitania*, down 12 miles off Old Head of Kinsale on the southern coast of Ireland. Since May 7,

by J. John[illegible]anta

1915, the *Lusitania's* strongroom has hoarded $5,000,000 in gold bullion, packed in wooden chests, and the purser's safe holds another million dollars in money shipments and jewelry. It is 201 feet deeper than the ill-fated *Merida*, sunk in collision 70 miles off the Virginia Capes in 1912, with $2,000,000 in gold and the former crown jewels of Mexico in her vault. These ships are located and marked with buoys, ready for divers equipped with helium breathing units to raise their treasures.

They have remained untouched so long because of the divers' helplessness in steel armored suits and their inability to leave diving bells designed to withstand overwhelming water pressure. Fear of contracting bends, diving's greatest terror, was also a deterrent

Nohl has perfected and successfully proven a new type of suit with self-contained helium and oxygen breathing unit, which unfailingly immunizes divers against paralysis, or bends Supported by equal amounts of pressure inside and out, the suit can withstand pressure at unlimited depths.

The suit is flexible, made of thirty layers of paper-thin rubber, and enables the diver to operate undersea searchlights and blow torches for cutting through steel blukheads which bar the way to ships' strong-rooms. It allows full use of the arms and legs. Access to ship's interiors is not hampered by helmet-to-surface air hoses which imperil the diver when fouled. Air lines to the newly-perfected aluminum helmet run only to export valves of the steel tanks of helium and oxygen strapped to the diver's back.

Totally immunized a g a i n s t bends by breathing helium, divers can put in a full day's work cutting or blasting open steel doors without being effected by water pressure. Thus the recovery of sunken gold may be expedited. Otherwise, it was previously a problem how divers could stay with the *Lusitania* long enough to get some work done

The new helmet is fitted with a telephone so that the user can direct the operations of other divers on the job. With a switchboard on the surface ship, divers on the bottom and surface crews can communicate with each other. When entering wreckage, however, divers can disconnect telephone cables and make them fast below, to avoid fouling or damaging them.

Incorporation of helium in diving has dis-

Diver Max Nohl, first human to breath helium under water, wears a fleece-lined canvas suit under the outer rubber suit which is one-half inch thick

An ordinary football helmet protects Nohl's head against the diving helmet. The device over his nose separates carbon dioxide from the expired air

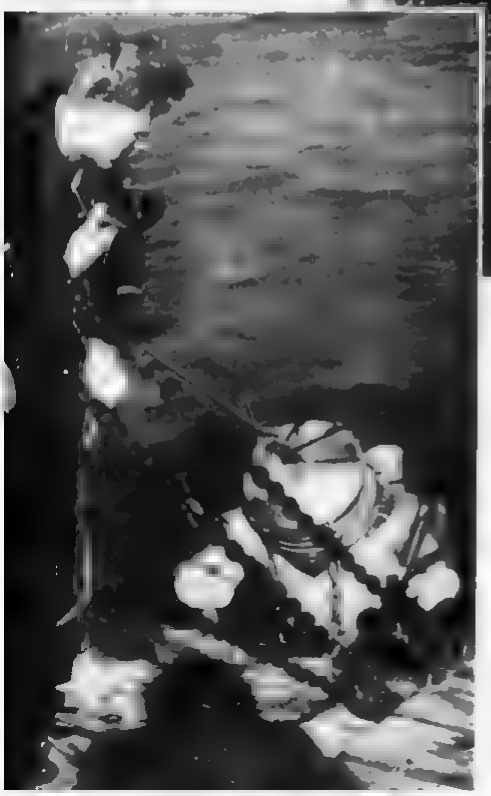
pelled old theories that the human body can withstand limited submarine pressure It proved that man has infinite ability to descend far deeper than previously without ill-effects.

The cause of bends has long been known, but means of prevention is entirely new The "bends" is literally the poison from fangs of great ocean depths that have defeated divers' attempts to reach coveted fortunes

In diving parlance, bends is the term for the often fatal paralysis and convulsions caused by breathing excessive amounts of nitrogen Old methods, involving helmet-to-surface air hoses, require breathing compressed natural air pumped down by compressors. Stepping up the air pressure thus subjects the diver to breathing four to six times the normal amount of

Not the Man from Mars, but Max Nohl as he appears in his flexible rubber suit with the oxygen and helium tanks strapped to his back The valves at his left side permit convenient adjustment of the breathing components. He communicates with the surface man by means of telephone

Making a new world's record! Nohl coming to the surface (below) after his remarkable dive of 420 feet



nitrogen. Atmospheric air contains 79.93 parts nitrogen

The blood can cope with normal amounts of nitrogen entering it from the lungs, but not excess quantities forced down by compressed natural air. Consequently, the excess forms gas bubbles in the bloodstream These retard the circulation, even check it

[Continued on page 118]

Device Bores Hole 14 Feet Deep In Ten Minutes

Fitted with a 30- or 36-inch auger, this earth-boring machine is capable of digging a 14-foot hole within ten minutes. The truck's motor supplies power for the digging operations.

INTENDED for use by power companies, railroads and other large industrial organizations, a newly developed earth-boring machine digs a 36-inch diameter hole to a depth of 14 feet in about ten minutes. Two men, the most that could be used advantageously on a hole of this size, would require about three days to dig the same hole by hand methods.

The boring machine is mounted on a truck, the power for digging being supplied by the truck motor through a gear arrangement. The collapsible digging tower of the borer is 18 feet long and a 20-foot auger shaft is equipped with 30-inch and 36-inch augers which dig to a maximum depth of 14 feet.

The machine rotates on a turntable so that holes can be dug on either side of the truck, or behind it. A large spotlight on the tower of the borer supplies illumination for night work. The operator's seat is placed so that he can watch the digging and control the various operations by means of levers.

Spiral Scoops Remove Snow

PREPARING for winter weather, the City of New York recently purchased three of the latest type snow removing trucks. Each truck features a spiral-drive scoop mechanism, mounted in front of the motor, which serves to dig into snow drifts and forces the snow up into a curved duct from which it is expelled into waiting trucks and hauled away. The snow trucks are mounted on wheels equipped with heavy duty tires, while the chassis are mounted high in order to insure passage over small snow piles and ice blocks. The scoops are lever-controlled.

The spiral-drive scoops on these snow trucks force snow up into the curved ducts which dump it into disposal trucks

Pumpkin Boasts Human Face

Human features were impressed on this pumpkin by means of an aluminum cast mask placed around it when small. As pumpkin grew, cast was removed and features were retained

AFTER four years of experiments, John M. Czeski, of Madison, Ohio, has succeeded in producing a pumpkin with features like those of a human face. The novel effect was created by placing an aluminum cast around a pumpkin when it was scarcely the size of an indoor baseball and allowing the cast to remain until the pumpkin had filled the inside contours. After removal of the cast, the impression of the features remained on the pumpkin as it grew in size.

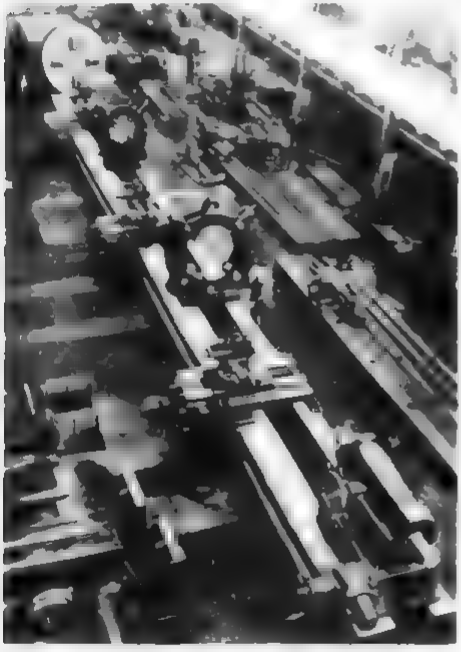
Seismograph Has Magnification Of 100,000 Times

A NEW seismograph machine recently installed in the Seismograph Observatory at Fordham University in New York, N. Y., is said to be super-sensitive, possessing a magnification of about 100,000 times Distant and "local" earthquakes will be recorded with equal clarity, according to experts

The new machine is so sensitive to the slightest earth tremors, that, when first installed, adjustments had to be made to offset the recording of earth vibrations caused by passing autos, trucks, etc., blocks away

Dr William A Lynch of Fordham University New York, N. Y., shown making adjustment on the college's new seismograph machine which boasts a magnification of 100,000 times

Mammoth Lathe Constructed



This gigantic lathe is capable of turning castings and forgings up to 65½ feet long with diameters up to 82 inches

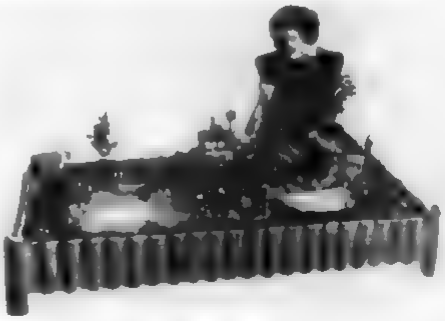
ELECTRICALLY operated by push-button control, a giant lathe developed in Westphalia, Germany, is capable of turning any casting or forging up to 65½ feet in length with a diameter up to 82 inches. The headstock has 16 controlled speeds, enabling all work materials to be tooled at the most appropriate cutting speed

The mammoth lathe is silent and practically vibrationless in operation, being provided with continuous oil circulation for all parts.

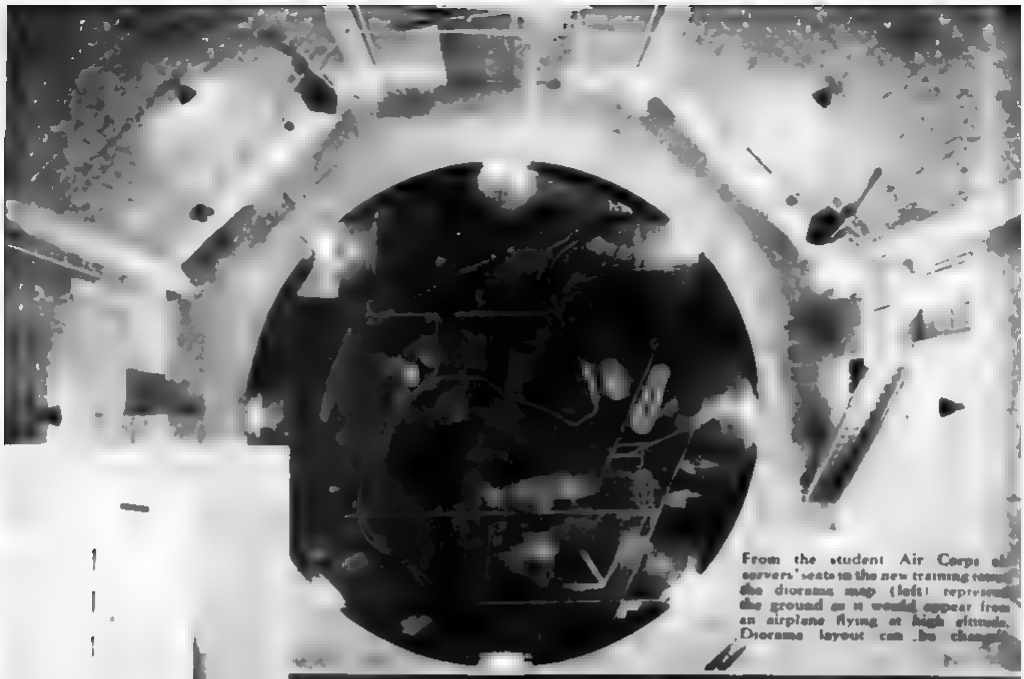
Creates Miniature Gardens

FEATURING compactness and lightness, whereas most indoor gardens are heavy because of the amount of soil needed for plants, novel miniature gardens created by Mr. S. Sasabe, of New York, N. Y., contain no earth at all, each plant being contained in an individual pot which is inserted into false bottoms of the tiny gardens. The gardens range in size from 2x2 feet to 6x16 feet

Primarily, the indoor gardens each consist of a tin tray upon which are painted the course of streams and lakes, hills of papier-mache, stones and a loamy-looking surface of moss, dyed grass-green. Holes in the tray permit insertion of the plant and flower pots, which can be removed at will to be placed outdoors in the rain and sun for freshening while other plants are substituted in the garden itself, providing an ever-changing scene



A tin tray, papier-mache rocks, collapsible houses and real plants are features of this novel miniature indoor garden

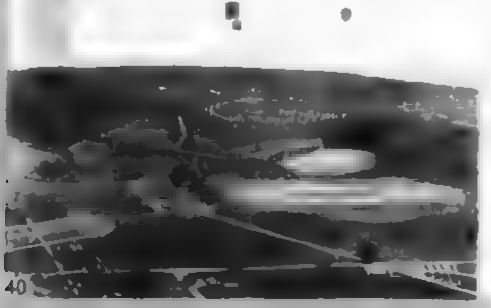


From the student Air Corps observers' seats in the new training room the diorama map (left) represents the ground as it would appear from an airplane flying at high altitude. Diorama layout can be changed

Ground Range Trains Air Corps Bombers

Exterior view of bombing range

Above—Watching the scaled diorama map from circular balconies the student airmen report their observations to an instructor by means of radio transmitting keys located at each desk. Note instructor on platform slung from tower ceiling



Shown above is a close-up of the diorama map. Note the toy soldiers, cannons, trucks, etc. Six hundred hidden electric light bulbs flash at intervals to represent striking bombs, the locations of which will be reported by the observers

A MINIATURE bombing range has been developed by the U. S. Army Air Corps to facilitate the training of observers and bombing plane crews. The range consists of a scaled diorama map housed within a tower 65 feet high with a diameter of 68 feet

The diorama map is located at the base of the tower and balconies extending from the tower walls at heights of 40 and 50 feet contain desks equipped with radio transmitting keys with which the students report their observations to instructors. From their seats in the balconies, the map appears to the students as the ground would from an airplane flying several thousand feet high

The diorama map features toy soldiers, cannons, trucks, trees, etc., as well as 600 hidden electric light bulbs, the flashing of which can be controlled by the instructor to simulate striking bombs or artillery fire. The students thus learn to observe and direct artillery fire, report troop movements, gun positions, effects of bombing, etc., without actually going aloft in a plane. Of course, this ground training is only elementary, actual flight observations being required of the student before an observer's rating can be obtained

Surgeon Devises "Mill" To Shape, Cut Living Bone

DESIGNED by a well-known bone surgeon, Dr Fred H. Albee, of New York, N. Y., an electrically-operated portable bone-graft "mill," weighing four pounds, is used to model living bone with the same precision and nicety that an expert mechanic uses in shaping a metal machine part. The unit has a complete set of miniature machine tools, and enables a surgeon to discard the older hand methods of bone shaping.

The numerous attachments are used to make any desired shape of inlay, wedge, peg, dowel, and screw from bone and also to prepare the cavaties in the surrounding bone of the patient, even if deeply imbedded in tissue. In operating the unit, a foot pedal drive leaves the surgeon's hands free for his delicate work. Use of the machine is said to shorten operating room procedure and this, combined with the ease of operation as compared to hand-shaping, relieves the shock and strain on the patient

This bone-grafting "mill" enables surgeons to mechanically cut and model living bone Insert shows how device cuts bone.

Cruiser Model Run By Radio

Controlled by radio from shore, this battleship is a perfect replica of French warship *TERRIBLE*. Note torpedo tubes.

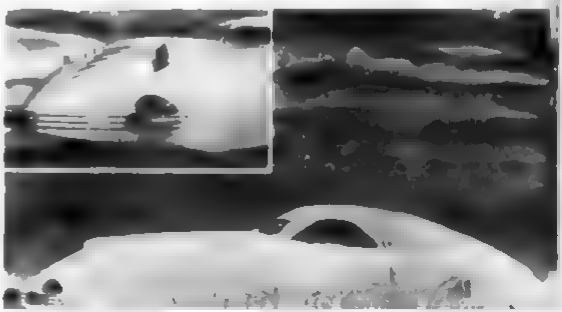
COMPLETE in every detail, including gun turrets, torpedo tubes, bridge controls, and miniature sailors, a ten-foot radio-controlled model of the French cruiser *Terrible* has been constructed by an English enthusiast. The miniature warship is capable of performing various sea maneouvers such as full speed ahead, turns and half speed astern, control being exercised by a radio transmitter located on shore.

Novel Auto Goes 122 M.P.H.

FEATURING a front-wheel drive, electric gear shift and four forward speeds, a new streamlined auto has been designed and built by a Pittsburgh, Pa., manufacturer. The unusual looking car, known as the "Phantom Corsair," is said to travel 122 m. p. h.

The new auto has seats made of molded rubber, without springs, and the body ceiling and interior side-walls are lined with cork composition. To facilitate entering and leaving the car, a small roof door opens simultaneously with the side doors.

Featuring ultra-streamlining, this "Phantom Corsair" auto has no fenders or running board Close up shows radiator



WHEN DUST

When dust from a million bushels of grain exploded in an elevator at Quincy, Ill., all that was left was the smoldering ruins shown above. Left—A U. S. Department of Agriculture testing station for conducting experiments with self-opening windows to determine their value in preventing damage from dust explosions by releasing explosion's pressure. Note explosive flames leaving window

HAUNTING America's castles—those gigantic, concrete structures dotting the shipping terminals—is a public enemy more deadly than all the ghosts of all the medieval citadels known to man

"Combustible dust" is the name of this insidious foe. It lurks in 28,000 elevators, mills, factories and warehouses, a constant menace to the lives of 1,325,000 Americans and $10,000,000,000 worth of property. It explodes with more destructive violence than a gangster's bomb, haunts industry more persistently than its many victims' ghosts, and mocks inventors' efforts to circumvent, ensnare or confine it

An example of its devastating power is afforded in the case of a 10,000,000 bushel grain elevator in Omaha, Nebraska, the biggest of its kind in the world, where this public enemy appeared suddenly one noon and blew four men to their death. United States agents came a running, but as usual, the murderer had vanished into thin air leaving nary a clue

The Omaha elevator was considered blast-proof. Newly built, it embodied numerous ultra-modern tricks of construction One of the most interesting was the manner of attaching the roof. Though bigger than a circus tent, the entire top of the elevator was suspended with cables. Should there be an explosion, the builders thought, this roof would be lifted into the air and the pressure inside relieved. Then the roof would drop back down. Such harm as might be done would be comparatively slight.

But the blast, when it came, roared right through that suspension roof, carrying two men with it. One landed outside, killed instantly; the other fell back through the

EXPLODES

As destructive as a racketeer's bomb, combustible dust exacts its toll of business.

by Volta Torrey

Three hundred firemen worked through the night to keep the blaze from spreading when exploding grain dust wrecked this elevator in Chicago, Ill., causing damage estimated at one million dollars

roof into a bin full of soft grain, unharmed

Two other persons were crushed and suffocated beneath the mountain of grain and machinery and it took three days for firemen to tunnel their way through the wreckage to the bodies. Even this was done only at great risk. From a score of cracks, grain trickled through in steady streams, any one of which might grow into a death-dealing deluge at any moment. This also kept the air surrounding the workers constantly saturated with the dangerous dust

Equally horrible, but in another way, was a bronze company plant explosion in Painesville, Ohio Firemen sped to the scene, but dared not throw water on the blazing ruins—even though they knew human beings were in the inferno—because the explosion had been caused by aluminum powder and to put water on it would only have caused more dynamic blasts.

This tragedy was unique in that one of the victims lived long enough to tell what touched it off. A mechanic, he said, dropped one of his tools on a piece of sheet metal. It

Five successive explosions of combustible dust virtually tore the entire wall out of a twelve-story grain elevator in Baltimore, Maryland, as shown above

gave off a spark and this set fire to some aluminum powder which had accumulated.

The worker ran for a pail of sand, the customary method of fighting such fires being to build a wall of sand around them and let them burn themselves out, without spreading to other places. In his excitement, this laborer forgot the rules. Instead of building a little bank around the fire, he threw the sand on it. There was a flash—and five of the six men in the plant at the time were killed

Sometimes the "enemy" seems to delight in taunting investigators. After a wood dust explosion in a chair company plant at Cleveland, Ohio, an inspector was sent to examine the plant's boiler

He used an open torch, just as he had been doing for 20 years, setting it down inside the boiler so he could tap the pipes. The pounding dislodged some dust which had settled on them. It fell on the torch, ignited and exploded. Luckily, the flash passed over the inspector's head and he was not injured.

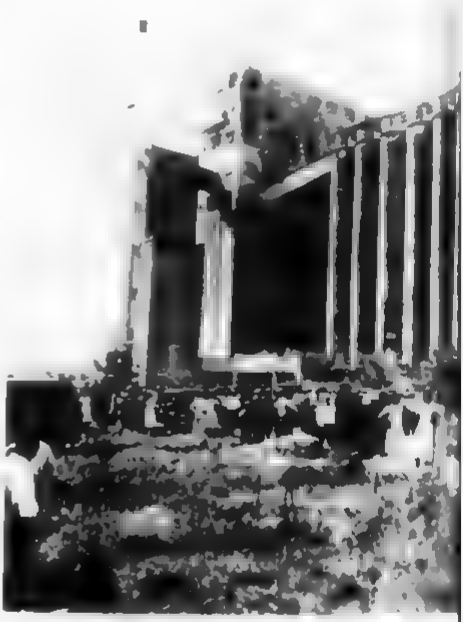
All these and many other explosions were investigated by Dr. David J Price, principal engineer in charge of the Chemical Engineering Division, Bureau of Chemistry and Soils, United States Department of Agriculture, and his staff of scientists. These men have no police powers, although they sometimes are called "dust detectives." Their whole concern is scientific research, and thanks to them the United States leads the world in this particular work

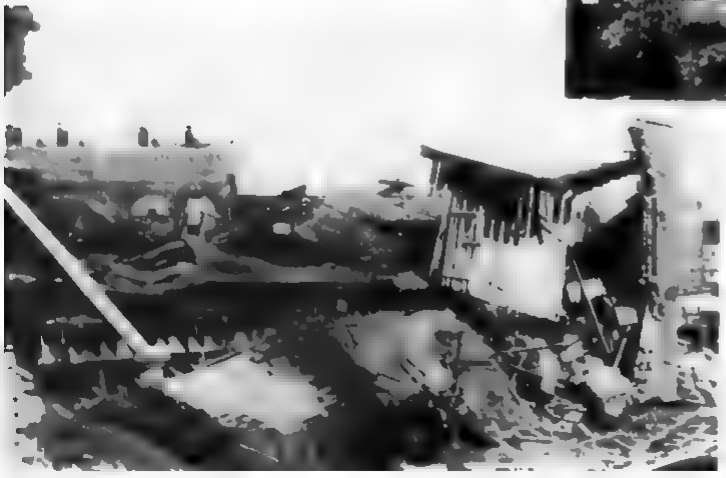
These experts have found that any kind of dust which will burn is likely to explode Why does the dust explode? Simply because the rate at which it burns is determined by the amount of its surface which is exposed to oxygen When fire travels from one particle to another, and encounters resistance in some form, there is an explosion. That's all a dust blast really is, a spurt of flame darting quickly from one fleck of combustible matter to another. And it's just too bad for whoever or whatever gets in its way.

Since 17 persons died in a Richport, Vt. blast in 1908, and heavy damages were collected in the courts, possibly because of the management's neglect to install full safety devices, elevator owners and other industrialists have been extremely interested in preventing these explosions.

But it is no easy matter. Despite the best efforts of inventors, dust still collects in the air in many factories and warehouses And

[*Continued on page* 118]

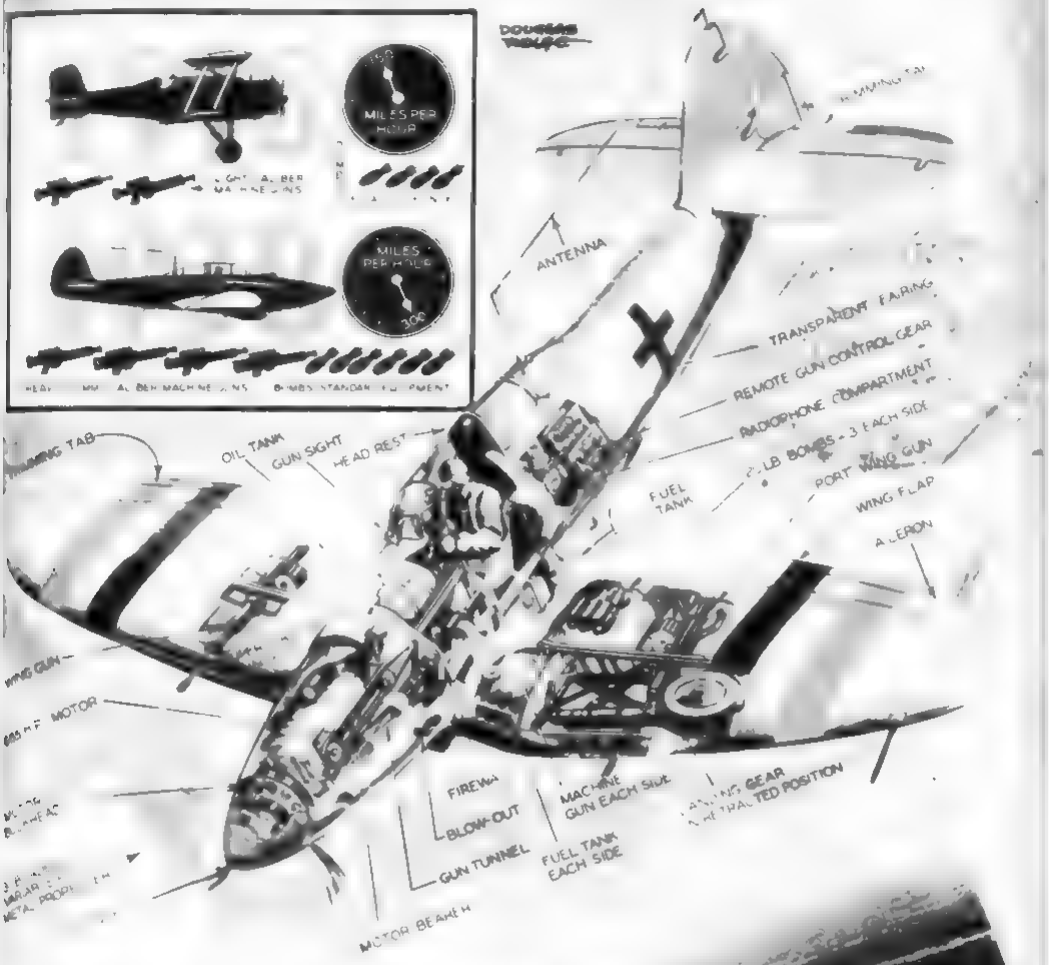




Six men were killed and six injured when a grain elevator in South St. Louis, Mo. (above), said to be one of the largest in the world, was added to the list of dust-blasted buildings. Relatives and friends await removal of victims' bodies by firemen. Note blown-out windows

Left—The devastating power behind dust explosions is vividly shown in this photo of the wreckage of a packing plant in Kansas City, Mo. Seven workers were trapped under the pile of debris until released by firemen after four hours of digging

Germany's Latest War Bird

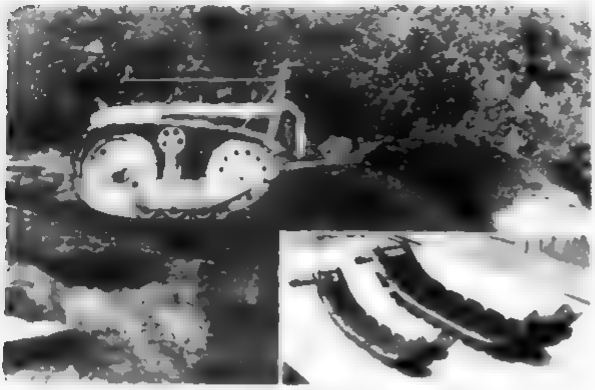


CAPABLE of speeds exceeding 300 m. p. h., according to report, and boasting an armament of four machine guns and six 20-pound bombs, the HE112 pursuit plane pictured here is Germany's latest bid for supremacy in the European nations' race to build a superior air force.

The sketch at top of page provides a graphic comparison of the design, armament and speeds of war planes of 1918 and modern pursuit planes. The large center sketch shows details of the equipment of the HE112. Note the position assumed by the landing gear wheels when fully retracted during flight.

The new German HE112 pursuit plane is powered by a 685 horsepower engine. Note holes in wing and motor cowling for machine gun armament.

Rubber Tracks Reduce Noise Of Tractor Operation



Tracks made of specially prepared rubber (close-up) enable this tractor to do its customary work efficiently and to travel along highways as silently as a rubber-tired truck.

WHEN fitted to an ordinary tractor, a newly developed rubber-jointed track enables the machine to travel along a highway with no more noise than an ordinary truck rolling on pneumatic tires. In addition to the great advantage of silence, the rubber track requires no lubrication and less engine power is needed to run the tractor, as the track joints are practically frictionless in operation.

The cushioning quality of the rubber track eliminates shocks thus insuring longer life for the entire tractor mechanism. Although no estimate as to the probable life of the rubber track has been made, tests made in England, where the track was developed, indicate that there is very little wear of the specially prepared rubber under average working conditions.

Auto Has Windshield Washer

CONTROLLED by a small button concealed on the flange of the instrument panel, a new device for spraying two fine streams of water on the windshield to clear away road splash, mud, rain spots or insects is a featured accessory of an automobile produced by a well-known manufacturer. The entire mechanism is vacuum operated, and is said to be faultless in operation.

The complete windshield cleaning unit consists of an automatic pump and a water container mounted on the dash under the hood. Rubber tubes connect the water container to small pipes, installed in the wiper castings at the base of the windshield, from which the water is ejected when desired.

Mounted on the dash under engine hood, this cleaning unit ejects a fine spray of water on windshield at the mere pressure of a control button concealed on instrument panel.

Heater Fits Hot Water Bags

SCREWED into the neck of an ordinary rubber hot water bag in place of the usual stopper, a newly developed automatic cartridge-type heater unit plugs into any convenient electrical supply outlet and provides the means whereby the water in the bag can be kept hot for long periods. The amount of heat generated is controlled by an adjustable built-in thermostat.

The automatic heating unit eliminates the sudden shock incurred when applying an ordinary hot water bag, since the water is placed in the bag while only luke warm and is gradually raised to the desired temperature by means of the heating unit.

Portable Device Simplifies Metal Hardness Tests

A NEWLY developed instrument, the Telebrineller, is said to simplify metal hardness tests in the field, remote from laboratory facilities, and around industrial plants. Weighing only six and a half pounds, it can be carried to the job at hand, eliminating the necessity of dismantling the equipment to be tested

To use the device, a metal bar of known hardness is inserted within a tube in the instrument, which is then held against the metal over the spot to be tested. An "anvil" on the instrument is then struck a sharp blow with a five-pound hammer, the impact being transmitted equally from the anvil to the bar and, through a small metal ball, to the surface of the metal being tested. The impact, being equally applied regardless of the force of the blow, results in impressions in the bar and metal being tested, the diameters of which are relative to the hardness of the bar and specimen, respectively

Tapped with a hammer (left), a ball in this newly developed instrument makes an impression in a metal bar of known hardness and in pipe being tested. Comparison of diameters of the impressions made (right) enables operator to determine hardness of metal pipe. Insert shows device's construction

Boys Build "Pumpmobile"

By combining half a bicycle with a coaster wagon, as shown here, two boys in Dobbs Ferry, N. Y., developed a machine which they call a "pumpmobile." Both take turns at pedaling

TWO young inventors in Dobbs Ferry, N. Y., combined their resources, consisting of half of a bicycle and a four-wheeled coaster wagon, to produce a novel vehicle which they call a "pumpmobile." The fork of the bicycle was mounted on the rear of the coaster wagon, locomotion for the combination vehicle being secured by pedaling the bike's one wheel

Museum Has "Human Book"

AMONG the recent additions to the exhibits at the Museum of Science and Industry in New York, N. Y., is a "human book"—a full size reproduction of a male torso and head which is arranged in vertical leaves, each leaf showing organs that compose the body structure of a human being. The leaves of the human book can be removed separately for study by students

Featuring layers that open like the leaves of a book, this model of a man's torso and head is on display in a museum

MAIL PLANE TO BE LAUNCHED IN MID-AIR

Carrying a load of 20,500 pounds mail and fuel, the small seaplane component of this composite aircraft will be launched in mid air from top wing of the larger plane after which the small plane will carry its mail cargo from England to America

THE modern demand for long range flying at high cruising speeds has presented a take-off problem for highly loaded airplanes As one solution to the problem, Major Robert Mayo, of England, has designed a composite aircraft, which consists of a small, fast, heavily-loaded seaplane mounted atop a huge, lightly loaded seaplane, the larger plane serving to carry the smaller one aloft to an altitude of about 10,000 feet before launching it

The powerful four-engined lower component of the Mayo Composite Aircraft, as the novel craft is officially named, is equipped with a special strut-type structure to which the smaller, but heavily loaded, seaplane is firmly attached. Until the actual planned separation of the two aircraft has been made in mid-air, the controls of the smaller plane are locked to prevent a premature launching.

The combined wing area of the small and large seaplanes enables a take-off to be made from the water with a minimum run. Use of the larger seaplane as the launching medium enables the smaller plane to be loaded to its maximum of 20,500 pounds (mail, cargo and fuel), providing a cruising range of about 3,800 miles at 180 m.p.h., which will enable the mail carrying plane to fly non-stop from Southampton, England, to New York, N. Y. Trial flights of the composite aircraft are now being conducted and on the cover of this issue a MODERN MECHANIX artist has depicted the aerial launching as it will appear to observers

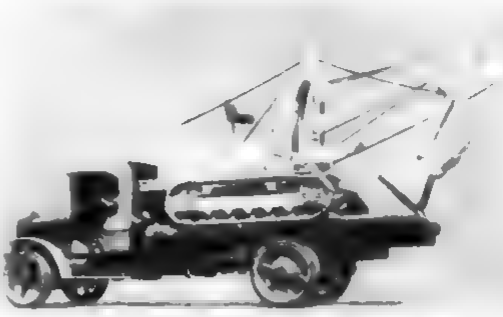
Metal Table Folds, Tilts Top

WEIGHING only 8½ pounds, a newly developed adjustable table features a top that can be suspended over a bed or chair directly in front of the user. The top can be tilted to any angle as shown below and its height is adjustable to any point from 25 to 42 inches above the floor. The table is built of metal and can be folded so that it occupies space no larger than its 21x16-inch top

Tractor-Dragline Can Be Transported On Truck

ELIMINATING the necessity of employing a huge slow-moving platform-trailer when being moved from one job to another, a newly developed tractor-dragline weighs only six and a half tons and can be transported on a speedy motor truck. Despite its small size, the new machine is capable of digging two ordinary house basements daily, its shovel scooping up three-eighths of a yard of dirt at one load

Known as a "shovelette," the machine's light weight is made possible by a nice balance of the operating machinery and the elimination of all excess counterweight. Facilitating transportation, the tractor-dragline mounts a truck under its own power by means of a ramp



Although small in size, this tractor-dragline is capable of digging two ordinary house basements daily. Its light weight (6½ tons) enables it to be transported on a small motor truck

Test Streamlined Motorbikes

These streamlined motorbikes were recently tested in a for-um road race. One machine features a retractable third wheel (right) while the other has a wheel covered by a nacelle

TWO entirely streamlined motorbikes recently competed in a test race held near Frankfurt, Germany, in an effort to qualify for entry in the International Record Race to be held there. The speeds attained were not made public

One of the motorbikes featured a lateral third wheel support which could be retracted at will, while the other had a stationary third wheel covered by a streamlined nacelle

Giant Coffee Urn In Service

THE U. S. Coast Guard base at New London, Connecticut, has been provided with a coffee urn which is believed to be the largest ever constructed. It holds 60 gallons of water and the handle on its cover is just within reach of an average size girl. The big coffee maker is the center of attraction on cold nights for men returning from chilly excursions aboard patrol boats

Standing on her toes, this young lady can just reach the top of a huge urn used to make coffee at a U. S. Coast Guard base

Twin-Engined Plane Flies 250 Miles On One Engine

With one of its two 285-horsepower engines stopped, this Beechcraft transport plane flew 250 miles at 125 m.p.h

USING only one of its two 285-horsepower engines, a Beechcraft Model 18 transport plane successfully completed a flight between New York and Philadelphia, Pa., covering a total distance of 250 miles at a speed of 125 m.p.h. With its two engines functioning, the transport ordinarily cruises at approximately 195 m.p.h.

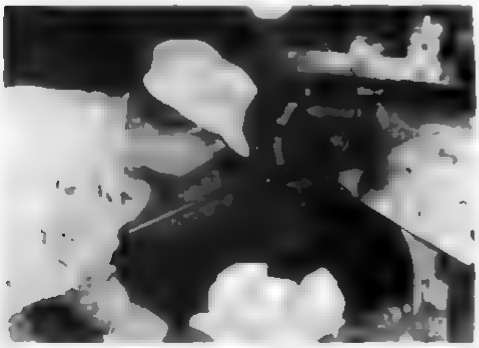
The Beechcraft took off from Floyd Bennett Airport, Brooklyn, N. Y., using both engines. Once in the air, the port engine was stopped and the propeller held stationary by means of an ordinary automobile brake drum assembly, which was balanced and machined to fit the propeller shaft.

Water Lights Lifeboat Lamp

AN AUTOMATIC lifeboat lamp that lights only when the boat is in contact with salt water has been invented by Gunnar Winckler, of Worcester, Mass. The salt water, which conducts electricity, fills a well in a "battery" which supplies electric current to the lamp, completing the circuit. When the boat is hauled out of the water, the salt water in the well leaks out, breaking the circuit and extinguishing the lamp.

Locomotive Tries Milk Fuel

DEMONSTRATING its energy value, two tons of dried milk in the form of briquets was used in place of coal to fuel the locomotive of the Dixie Limited at the start of its run from Chicago Depot to Florida. The substitute fuel is said to have burned readily, providing as much heat as coal.



Demonstrating its energy value, dried milk briquets were used as a substitute for coal fuel on a Chicago-Florida train run

Coaxial Phone Cable Tested

Top—Although smaller than an ordinary telephone cable the coaxial cable (fourth from right) carries 240 telephone messages simultaneously. Lower—Coaxial cable construction

BELIEVED to be the most important advancement in telephony in nearly two decades, a coaxial cable placed in test service between New York, N. Y., and Philadelphia, Pa., enables 240 telephone messages to be transmitted simultaneously. The cable is so new that machinery for manufacturing it commercially has not yet been invented

"Moving Mountain" Threatens Californians' Homes

THE homes of several residents in the Elysian Park section of Los Angeles, Calif., have been menaced by a mountain slide which smashed a bridge approach before it came to a rest within a few feet of the dwellings located along Riverside Drive. The mountain first gave way at its base, followed by cracks at the top which resulted in a total drop of more than 50 feet.

Residents in the threatened homes, reluctant to leave, set up crude devices to measure the extent of the daily progress of the slide. City officials, likewise, checking the "moving mountain," installed a siren alarm with which to warn the home owners when the time for immediate evacuation arrived.

Top—Aerial view showing the mountain slide which menaces the homes of residents in a section of Los Angeles, Calif. Lower—Pointed sticks held over a crack on mountain's crest serve as a means of determining whether a new slide threatens.

Machines Help Map Makers

TOPOGRAPHICAL maps, many of which are sold to the public for as little as ten cents each, are made on specially designed machines costing $30,000 each. There are only three of the machines, which are known as aerocartographs, in the country and they are operated by the U. S. Geological Survey Bureau in Washington, D. C.

Stereoscopic plotting of contour lines on topographical maps printed by the Geological Survey Bureau is made possible by these aerocartograph machines like the one shown here.

Invents Non-Blackening Bulb

AN ELECTRIC light bulb which, it is claimed, will not blacken during its lifetime, has been invented by Richard E. Smith, of East Cleveland, Ohio. A built-in screen, which prevents vaporized metal from the filament, heated to incandescence by the electric current, from reaching the inner surface of the bulb, features the invention.

Blackening of the bulb surface, which cuts down the amount of light given out, is considerable in the gas-filled types now in general use throughout the country.

The BOEING

The Boeing 40-B4 (left) helped make history by flying pioneer air mail and passenger routes.

An interest in aviation as a hobby led to the building of the world's largest bombing planes.

Circle—A squadron of Boeing P26-A low-wing pursuit planes in flight over Riverside, Calif. Introduced about 1932, these planes were regarded as the world's fastest single-seater fighting planes, having a speed of more than 235 miles per hour.

TO ANYONE familiar with aviation, the name Boeing calls to mind the engineering of a variety of aircraft from small fast pursuit ships to big four-engined "flying fortress" bombers and commercial transports. A two-decked flying boat with a wing span of 152 feet, which will be capable of carrying as many as sixty passengers and a 107-foot span low-wing monoplane, designed for high altitude and sub-stratosphere flying, are being developed by Boeing at this time.

It is interesting to note that the founding of the Boeing organization and the eventual engineering of these super transports is the result of an accident. Back in 1916, William E. Boeing, who had become interested in aviation as a hobby, and had learned to fly in California, had a crack-up with his plane. In contemplating the possibility that the damaged craft might be repaired in Seattle, he finally decided that an entire new plane should be built. Gathering a small group of interested men, he formed the Pacific Aero Products Company and in a small one room plant production was begun on the first Boeing ship, the B & W seaplane trainer of 1916. An unequal span twin-float biplane fitted with a 125 h.p. Hall-Scott motor, it had a cruising speed of some 60 m.p.h.

In 1917 the name of the organization was changed to the Boeing Airplane Company and the plant continued to produce training planes in the hope that they might prove acceptable to the U. S. Navy. The following year the first sizeable order was received from the Navy for fifty training planes of the "C" series. These two-place, twin-float biplanes were powered with A-7A Hall-Scott water-cooled engines.

In 1928 Boeing began pioneering in the field of commercial aviation with the production of the B-1 flying boat. This three-place job was constructed of spruce and ash framework with a two-ply cedar hull. Equipped with a 200 h.p. Hall-Scott, this flying boat had a top speed of approximately

PLANES

by Robert H. Rankin

The Boeing B-1 flying boat (above), a pioneer mail carrier, was built in 1919. Still airworthy, it was retired from service after flying approximately 350,000 miles and wearing out six engines.

Circle—William E. Boeing, famous airplane designer and builder. Above—A giant in its proportions and sleek in its streamlined beauty, the YB-17 four-engined bomber met with Uncle Sam's approval, the Air Corps ordering thirteen. Compare its size with that of the man standing in the background. Plane has wingspan of 105 feet.

95 m.p.h. It was with this boat that Edward Hubbard opened the nation's first privately contracted airmail service and the first international airmail service, between Seattle, Wash., and Victoria, B. C. By the time it was retired from active service, still airworthy, it had flown some 350,000 miles and had worn out six engines.

The first large Army order came to Boeing in 1921 when 200 MB-3A single-seater pursuit planes were contracted for. Of wood and fabric construction, they were powered with 300 h.p. Wright H-3 water-cooled engines and were built to a design furnished by the War Department. The MB-3A had a top speed of 140 m.p.h. and an absolute ceiling of about 21,200 feet.

Two years later Boeing began the production of the first pursuits built to their own design. These craft, known as PW-9's, were the first pursuits to be fitted with oleo shock absorbers. With a welded steel fuselage, fabric covered, and with wood and fabric wings, the PW-9 type was powered with the 425 h.p. D-12 Curtiss 12-cylinder engine which gave it a top speed of 160 m.p.h.

In 1925, Boeing developed the PB-1 patrol boat for the Navy. An interesting feature of this flying boat was the hull which was built of duraluminum up to the water line, above which it was built of ply-wood. This type of construction eliminated both weight and soakage danger. The PB-1 was one of the largest flying boats of the period and was

Produced in 1929, the P-12 single-seat biplane pursuit plane (left) became standard equipment with the Army Air Corps. Later, as the F4B, this Boeing plane also became a standard U. S. Navy fighter

Shown below is the Boeing XB-15, the "big brother" of all four-engined bombers. The Air Corps' largest airplane, the XB-15 has a 150-foot wingspan, weighs more than 30 tons and is powered with four 1,000-horsepower engines. Because of its six machine guns, the gigantic bomber is known unofficially as the "flying fortress."

powered with two 800 h.p Packard engines mounted in tandem. It had a maximum speed of 112 m.p.h. and a range of more than 2,000 miles.

In 1927 Boeing definitely entered the commercial field when the organization was awarded a contract to fly the mail between Chicago and San Francisco. The Boeing bid for this contract was but half that of the nearest competitor and financial observers called it frenzy, believing it could never be successful. However, in a period of but five months, Boeing designed, produced and placed in active service a fleet of 25 mail-passenger planes, known as the Model 40-A's. These craft were two-passenger biplanes powered with Pratt & Whitney Wasp engines and they helped to make the Boeing mail venture highly successful. The 40-A's were followed by the four-passenger P & W Wasp powered 40-B's and the four-passenger Hornet powered 40-B4's

In 1928 the Model 80 tri-motored, 14-passenger biplane transport was introduced With its three 525 horsepower P & W Hornets, the Model 80 had a top speed of 138 m.p.h. fully loaded and it brought a new degree of travel comfort to the airways. It was with planes of this type that United Air Lines established a 27-hour coast to coast service over the mid-continent route of their system

In 1929 the famous P-12 pursuits were produced and within a short time they became standard service equipment in the U. S Army Air Corps. Later as F4B's they became standard with the Navy. Especially noted for their speed and maneuverability these single-seater biplanes were powered with 450 h.p. Wasps and had a high speed well over 170 m.p.h. The Army version of this type was developed as the P-12A P-12B, P-12C, P-12D, and P-12E, while the Navy edition was developed as far as the F4B-4, attesting to its ability.

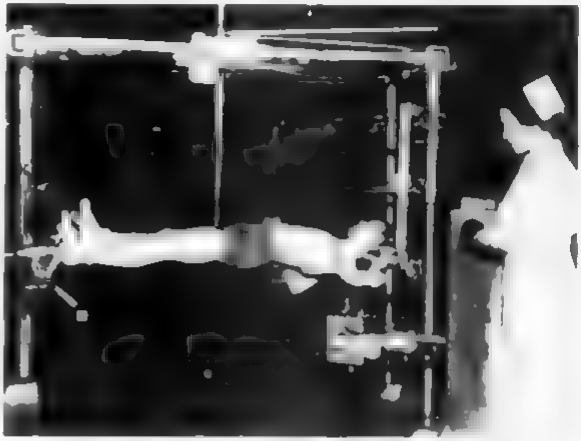
The year 1930 brought the introduction of the Monomail, the first successful American commercial smooth-skin, all-metal plane This was also the first plane to be fitted with a retractable landing gear. It carried five passengers, their baggage, and 700 pounds of mail at a top speed of 160 m.p.h. This Hornet

[*Continued on page* 122]

Frame Suspends Patient For Surgical Operation

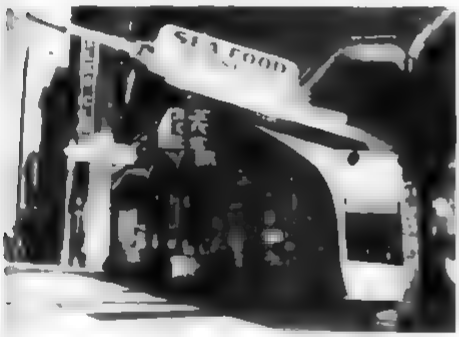
ALTHOUGH it resembles a medieval torture machine in general appearance, a newly developed operating room frame is said to provide increased comfort for the patient and affords the surgeon free access to the field of operation. The frame is specially designed for fracture and orthopedic operating work.

The new apparatus employs the principle of suspension from above, rather than support from beneath and the patient's body lies on padded rests at the head, small of the back, and below the thighs. The feet and hands are strapped to other supports on the frame



This is not a torture rack, but the latest type of fracture and orthopedic operating frame. Patient's body is suspended, affording surgeons an unrestricted operating field.

Restaurant Resembles Ship



The reproduction of a sailing ship's bow and bowsprit helps an Erie, Pa., restaurant to attract patrons. Note rigging

A SEA food restaurant in Erie, Pa., provides diners with a real nautical atmosphere Customers are attracted to the restaurant by show windows which are fitted into a reproduction of a bow and bowsprit of an old sailing ship, complete with rigging. A ship's bell, ringing out the half hours in sea-going style, also helps to attract diners.

When the prospective diners enter the restaurant they are further impressed by an interior resembling a real ship, as lanterns, anchors, rope, and other nautical paraphernalia adorn the walls.

Plane's Cabin Slides Open

A NEW all-metal sportplane produced by a western manufacturer features a cabin with an overhead sliding hatch which facilitates entrance and exit. In flight, the hatch may be kept open, closed or locked in several intermediate positions.

Entrance to the plane's cabin is accomplished by use of a walkway along the wing at a point next to the fuselage. The step onto the wing is not high enough to cause inconveniece to passengers or pilot. The plane also features an automobile type engine hood, which operates on hinges, thus providing easy access for motor adjustments, minor repairs and valve clearance checks.

Constructed of glass, the sliding hatch of this sportplane not only enables the pilot and passenger to enter without stooping, but also provides excellent vision in flight.

To obtain addresses of manufacturers of products mentioned in MODERN MECHANIX, send a stamped and self-addressed envelope to the editors.

Medicated "Shots" Preserve Poles

Clamped over shaved pole butts, rubber tubs (above) hold termite-killing "medicine" which is supplied, under pressure, until chemicals have had ample [illegible] impregnate the sap wood. Below—Placing a tub on butt.

Above—The chemical mixing and storing plant. Below—This compressor provides constant pressure on chemicals in the rubber tubs clamped tightly around pole butts.

TO PROTECT wooden poles and piling against the ravages of termites and marine borers, a Seattle, Wash., firm has developed a compressed air system of impregnating the wood with medicated "shots" consisting of a mineral-salt compound with an arsenic base. The "medicine," which can only be forced into green wood containing sap, also makes the wood highly fire-resistant and increases its strength.

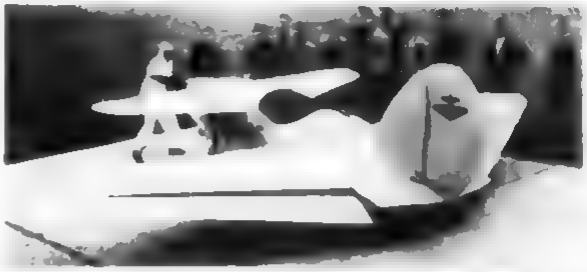
The impregnating process takes from four to seven days to completely treat a 40-foot pole. The butt of the pole is peeled down with a draw shave to an approximately circular form without cutting into the sap wood and a rubber cap, resembling a wash-tub in form, is then placed over the butt, being held tightly in place by wire cables and chains.

The rubber cap has a nozzle to which a hose line leading to tanks containing the "medicine" is connected. A compressed air engine is then used to force the chemical solution into the rubber cap where it gradually is impregnated into the sap wood

French Flivverplane Has Novel Wing Arrangement

POWERED by a motor of only 20-horsepower, a newly developed French "flivverplane" is said to be capable of traveling at a speed of 95 m.p.h. Enough fuel can be carried by the tiny plane to insure a minimum cruising range of 350 miles.

Boasting two wings of novel shape and design, the diminutive plane presents an unusual appearance both in flight and on the ground. The front wing is tapered and connected to the fuselage at a point in front of the cockpit. The rear wing is tapered, has a forward sweep, and features airfoil panel controls which serve as ailerons for banking the plane during turns and as an elevator to control the plane's climb or descent.



Presenting a novel appearance because of the peculiar arrangement of its wings, this French "flivverplane" is said to travel at 95 m.p.h. and has a cruising range of 350 miles.

Amateur Creates New Glue

In his cellar laboratory, Benjamin K. Albrecht, an amateur [illegible], compounded a glue long sought after by skilled chemists. It enables metal sheets to adhere to wood, plaster.

IN A SMALL cellar laboratory, Benjamin K. Albrecht, an amateur chemist, is said to have solved a problem which for years has been the despair of industrial chemists —the compounding of a glue that would cause thin sheets of copper, brass or other metal to adhere smoothly to plaster or wood surfaces. The Albrecht adhesive defies chemical anlysis because some of the ingredients vaporize before they can be properly identified by chemical tests.

Rather than organize a company, which would necessitate disclosure of his formula, Mr. Albrecht plans to produce the new adhesive on a small scale only.

Biologist Checks Bird Flight

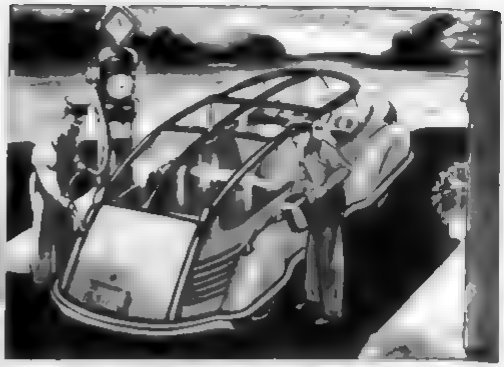
DUCK hunters sometimes declare mallards pintails, and other waterfowl they miss were traveling 75, 100 or even 150 m.p.h. More likely, the birds were flying between 40 to 70 m.p.h., according to a report made to the Department of Agriculture by May Thatcher Cooke of the Biological Survey Bureau. The report includes tabulated records on the flights of more than 100 classes of birds found in the U. S.

The report states that the age, state of plumage, and other physical conditions of the birds result in varying flight speeds even for birds of the same species. Wind and other atmospheric conditions also cause speed variations, but tail winds do not help the birds' flights as much as might be expected. This is explained by the fact that in order for a bird to remain aloft it must rest on a current of air against the under side of the wings and this current must come from the front, not from behind, the backward tilt of the wings catching the wind.

Tiny Watch Worn Like Ring

CAPABLE of running for 46 hours without rewinding, a tiny watch developed by a Swiss manufacturer is fitted to a band and worn like an ordinary finger ring. The watch features unbreakable glass.

Worn like an ordinary ring, this watch keeps accurate time.



Right—The car of the future will probably have bumpers on all sides and carry gasoline and water in its hollow tubing body framework, which will be of unusual strength due to further developments in metallurgy. Above—A cowl assembly testing machine in a modern auto plant. These cowls were oscillated sideways, forward and backward 250,000 times without showing any trace of joint trouble.

COMING

SAFE because it's unbreakable—is that the picture of the automobile as it will be in the near future?

Many engineers say "yes," pointing to the greatly fortified 1938 car as evidence The majority of them agree that if cars can be built with sufficient strength to withstand today's punishment it should be but a short step to a car that can take a bad spill and not be any the worse for it.

The idea that cars should crack up when they collide is coming to be regarded as a relic of pioneer days in motordom. Many years ago engineers decided that unless they built what is known as a high "factor of safety" into each of the car's major units there could be no real endurance. Cars would not be practical with rear axles breaking down at every abrupt start or with springs collapsing every time a bad bump came along Now the demand is for greater security against the possibility of damage from collisions of all kinds.

This is indicated in the offering of grille guards and special bars for use in reinforcing the bumpers. It is not improbable that we will witness a revival of one of the features of the erstwhile Marmon car, in which the steel running boards served as side bumpers.

One of the popular attractions at amuseparks is the midget automobile which is surrounded by a continuous bumper. So much strength is provided by this simple arrangement that the driver can strike the wall or collide with another car without risk to either the car or himself. It is the unbreakable car of the future in miniature.

A few years ago a pioneer along these lines startled New York by striking "L" posts at speeds up to 35 miles per hour. With a special bumper on the front of his car he was able to laugh off the usual collisions with these immovable objects which have meant so much grief to motorists in Manhattan. The bumper took the shock gracefully, allowing the car to dissipate its momentum and come to rest without too much confusion. What the driver lacked then he now has with the

Running your car into an immovable object at 20 m.p.h. produces a shock that is as great as if you drove the car off the roof of a one-story building (above). Naturally, a head-on collision between moving cars involves an even greater shock.

Is the crash-proof car a dream? Read this prophetical article.

by Frederick Russell

CARS THAT CAN "TAKE IT"

newer cars—a carefully designed safety interior with no sharp protrusions and no controls that are apt to spear him. The combination at that time would have accelerated the trend now so evident toward the car that can "take it."

It isn't that drivers want to be able to crash into things without paying the penalty, but simply that they demand protection against that small, but always present, group of thoughtless operators who continually threaten to crash into them. At the present time any serious head-on collision is certain to result in expensive repairs not only to the front end assembly but to the engine itself. It is a popular wisecrack to refer to the engine of the modern car as the front bumper This may be a factor in hastening general adoption of the rear-engined car.

The car shown below was deliberately rolled over to test the strength of its all-steel body. It is such test "stunts" that will help automotive engineers to produce the safer and stronger, but lighter car of the future as depicted in the sketch above.

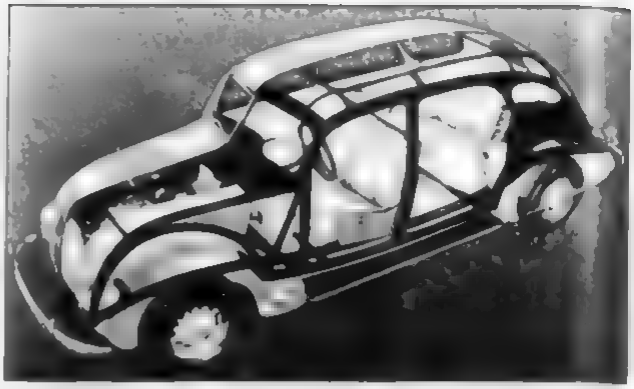
We have gone a long way with the all-steel body, non-scatterable glass and low center of gravity, but the car has had too many "arms and legs" that can be maimed in even minor accidents. There will be a tendency toward bodies of heavier gauge steel so that the body itself will help the chassis remain in alignment. Glass is now being perfected that will not even shatter when it receives a blow. The best we have today is glass that does not scatter when broken. Building the engine and chassis lower to the ground has done much to save upsets, but the next step is designing cars which cannot upset. Possibly motordom may borrow an idea from the familiar ash stand which can be tipped over but which will not stay upset.

The automobile industry knows no such word as "can't." It meets every challenge Today motorists are beginning to wonder why they should have to pay big repair bills if, through some miscalculation or misfortune, they have not been able to keep the car to a safe course. Motorists long since refused to consider a car so weakly constructed that the roughest useage would crack the frame Now they want a frame that will be equally shock-resistive in a collision

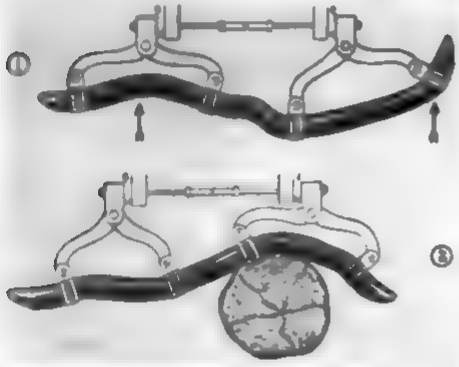
The shock-proof car can be done in quantity production because it is already being done on special order. One of the manufacturers of high-priced cars recently exported to Asia a remarkable vehicle for use by a foreign potentate. The car is entirely bullet-proof and is so strong that no ordinary collision could best it. There is no way anyone can gain access to its interior except

with the use of a special key. It is said to be armored motoring de luxe.

This does not mean, however, that we will have to carry around tons of steel in order to enjoy this new security awheel. We are going to benefit by the amazing new developments in metallurgy. Stronger but lighter materials will find their way into the picture. The camera is playing an important role in the study of the structure of metals. Weaknesses in steel are quickly detected through the micro-camera photo. And steel will be but one of the metals used in the fashioning of the car that will be impervious to collision.



The all-steel body of the modern car, as shown in the sketch above, is the forerunner of the safety car of the future. The automobile industry knows no such word as "can't," and its engineers are constantly experimenting with, and testing, new designs for cars that will be crash-proof.



Designed to ease the impact of head-on collisions with immovable objects, the bumper sketched above features a three-inch solid rubber bar attached to the chassis by pivoted steel claws. Fig. 1 shows how bumper looks when contacting an irregular object and, Fig. 2, when contacting a tree.

In fact, some go so far as to predict that rubber may be the answer to this new security. Many experiments along these lines are engaging the attention of those who are building tomorrow's automobiles today. Rubber is being used for so many parts formerly reserved for metals and wood it is not at all improbable that it will play a role in providing the answer to the problem of building parts that will withstand shock without breaking or without getting out of alignment. Rubber now is used for battery-cases, spring shackles, motor supports and many other parts which are subjected to extra strain. Success may lie in meeting the shock of impact by means of flexibility, resiliency, elasticity. It is exactly what they have done in solving the problem of excessive engine vibration.

Translate floating power into the effort to provide an unbreakable car and we see rubber in a new light. Perhaps the shock-proof car of the future will absorb impact, bending and yielding in accordance with the nature and severity of the blow, but without any serious consequences.

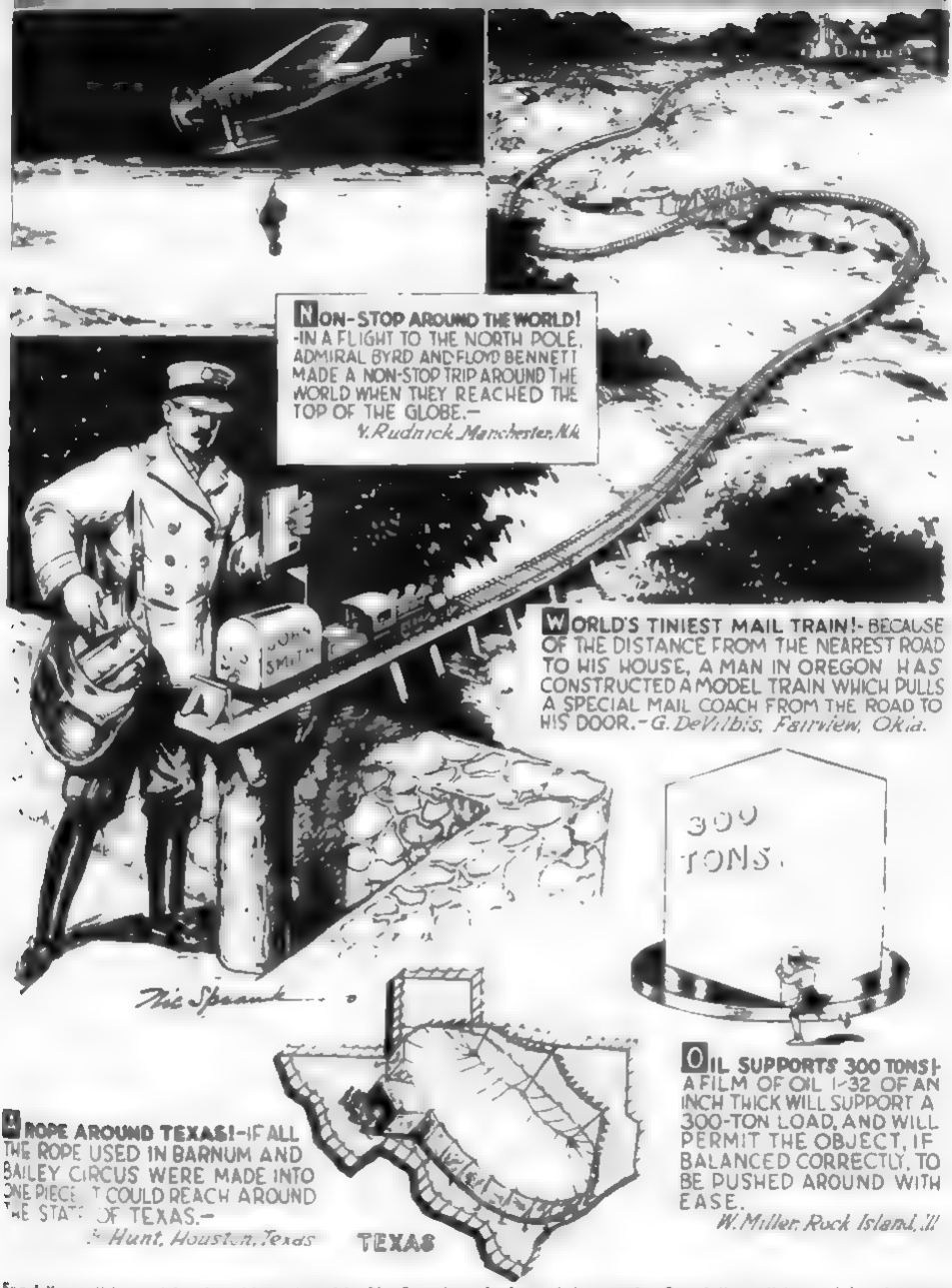
It is the low pressure tire that has done so much to lessen the annoyance and danger of puncture. High pressure tires banged over the road, forcing nails and glass through the tread to the inner tube. Today the low pressure tire actually rolls over many sharp objects, yielding but not picking them up.

Shock absorbers were first introduced in America in 1904. Their virtue largely lies in controlling spring action by checking excessive compression and recoil of the springs, but the "shocks" are a part of the stabilizing process, joining with the anti-sway bar in helping the car fight a million collisions with the road surface. It is incredible that with such remarkable strength and endurance under the car we still have extremities that fold up like a piece of cardboard when under any extra strain. All the driver need do is scrape a bit of high curbing and he has a badly mashed fender to show for it.

We are, of course, dealing with terrific forces when we aim to make cars immune to collision damage. A mass of two to four thousand pounds is something to reckon with when it is shooting through space a mile a minute. Did you know that at the modest speed of 20 miles an hour a car is shaken

[*Continued on page 122*]

TINY TRAIN CARRIES MAIL



NON-STOP AROUND THE WORLD! -IN A FLIGHT TO THE NORTH POLE, ADMIRAL BYRD AND FLOYD BENNETT MADE A NON-STOP TRIP AROUND THE WORLD WHEN THEY REACHED THE TOP OF THE GLOBE.— *N. Rudnick, Manchester, N.H.*

WORLD'S TINIEST MAIL TRAIN!- BECAUSE OF THE DISTANCE FROM THE NEAREST ROAD TO HIS HOUSE, A MAN IN OREGON HAS CONSTRUCTED A MODEL TRAIN WHICH PULLS A SPECIAL MAIL COACH FROM THE ROAD TO HIS DOOR.- *G. DeVilbis, Fairview, Okla.*

OIL SUPPORTS 300 TONS!- A FILM OF OIL 1-32 OF AN INCH THICK WILL SUPPORT A 300-TON LOAD, AND WILL PERMIT THE OBJECT, IF BALANCED CORRECTLY, TO BE PUSHED AROUND WITH EASE. *W. Miller, Rock Island, Ill.*

A ROPE AROUND TEXAS!-IF ALL THE ROPE USED IN BARNUM AND BAILEY CIRCUS WERE MADE INTO ONE PIECE IT COULD REACH AROUND THE STATE OF TEXAS.— *[illegible] Hunt, Houston, Texas*

Five dollars will be paid for the oddity selected by Nic Sprank as the best of the month. One dollar will be paid for all others used on this page. Send your oddity to Nic Sprank, Editorial Office, Modern Mechanix, 1501 Broadway, New York N. Y. Source or proof of each oddity must be given. Send all oddities separately, not with other manuscripts or letters.

Machine Enables Operator To Determine Egg's Sex

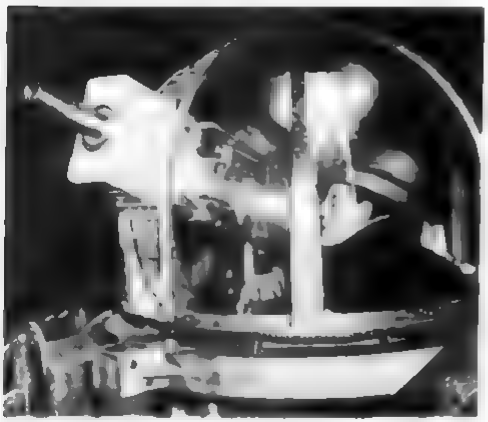
Devised by Dr. Williard P. Funk, retired university chemistry professor (seated), this electrically operated machine makes it possible to determine and change the sex of newly laid eggs.

AN ELECTRICALLY operated machine which, it is claimed, makes it possible not only to determine the sex of newly laid eggs, but to change the egg's sex as well, has been invented by Dr. Williard P. Funk, a retired University of Michigan chemistry professor. According to experts, the new machine may revolutionize the extensive hatchery industry.

To use the device, the newly laid eggs are placed in wood frames which have wire-mesh bottoms, the wire-mesh being connected to a cable leading to the machine while another cable leading from the machine is connected to a metal instrument held in the hand of the operator. When the instrument is held over an egg, the tone of the sound produced in the machine signifies the egg's sex.

Plane Cannon Demonstrated

A FLEXIBLY mounted airplane cannon recently demonstrated at Newark, (N. J.) Airport fires a 37-mm explosive shell weighing one and one-tenth pounds and filled with TNT. The shell is a safety type that cannot explode while being loaded in the cannon, which can be fired as a single-shooter or as an automatic with a clip of five shells.



Flexibly mounted, enabling it to be aimed in any direction, this new airplane cannon fires a 37 mm TNT-filled shell.

Splint Saves Horse's Life

Placed on an animal while under an anesthetic, the metal splint shown here holds broken bones together until mended.

USED successfully in treating about 200 dogs with broken legs, an adjustable metal splint was recently used by Dr. Otto Stader, of Philadelphia, Pa., to join the bones in the broken leg of a horse, thus saving the animal from the death usually meted out in such instances to end the animal's suffering. The "operation" took place at the University of Pennsylvania School of Veterinary.

The splint device consists of four stainless steel pins which are inserted into the bone above and below the break. The pins are then joined by an adjustable steel bar which enables the surgeon to set and hold the bone ends in place until the fracture has healed.

Electric Light Unit Shows Driver's Signals At Night

EASILY attached to the roof of an automobile at a point above the window on the driver's side, a compact electric light unit developed by a Long Beach, Calif., inventor casts a concentrated beam on the driver's arm when extended for signaling while motoring at night. The light is also said to be practical for reading road maps and can be used as an extra parking light in crowded areas to lessen the danger of sideswiping crashes.

The tiny safety light has five parts and is housed in a chrominum-plated, two-piece brass shell. The bulb is an ordinary taillight type, connected to the car's light switch by a wire which runs under the upholstery.

Housed in a metal shell (insert) mounted over driver's window (center), a compact electric light unit invented by Arthur Vaughn casts a beam on driver's signals at night (bottom).

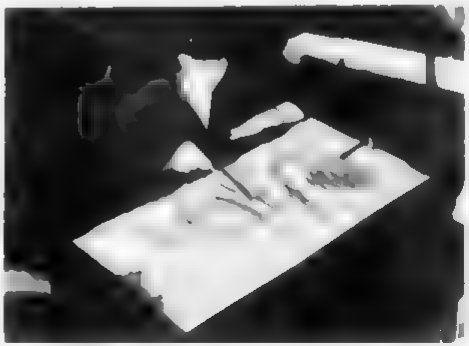
Hydraulic Scaffold Devised

Easily assembled, this hydraulically operated scaffold has an elevating range of from 2 ¼ feet to 22 feet above ground

ONE-MAN control, ease of raising, lowering and moving from one place to another are features of a new hydraulic scaffold produced by a well-known manufacturer. The scaffold operates through a range covering a height of only two feet, eight inches from the ground, to a height of 22 feet, rising at a rate of 8 feet per minute and lowering at 10 feet per minute. The unit is mounted on small rubber-tired wheels

Waterproof Sand Exhibited

WATERPROOF sand constituted one of the many marvels of modern chemistry exhibited at a Chemical Industries Exposition recently staged in New York, N. Y. In a convincing test demonstration, water was passed through a series of curves in the chemically treated sand without becoming even partially absorbed.



This test demonstration shows water passing through curves in chemically treated sand without becoming absorbed.

Dr. C. Audrey Richards, internationally known authority on Forest Pathology (left), dispenses advice that has saved many a wooden home from destruction by rot as shown above.

Woman is Wood Expert

EVER since 1928, when Dr. C. Audrey Richards became head of the Madison (Wis.) branch of the Division of Forest Pathology, Bureau of Plant Industry, of the United States Department of Agriculture, samples of decayed wood sent to the department at Washington, D. C., have been referred to her. It is only within recent years that the government has offered a diagnostic service such as Dr. Richards now conducts to help anyone who desires aid in solving problems of wood decay, but it has already developed to be a much sought after service.

To the uninitiated it is uncanny the way she is able to determine why the floor of a village library in southeastern Wisconsin rotted away within two years after it was built; why buildings up and down the West coast and in the Gulf states last only a few years; why, in a costly Florida home, only the metal electric light fixtures were usable five years after it was erected; what is causing the discoloration on a window sash; why veneer, wood pulp, or magazines mold, or why fence posts decay.

Dr. Richards' receipt, recently, of a pine board stained a brilliant red affords illustration of her work and service. The person sending the board from New Orleans wanted to know what was causing the red discoloration. It was up to Dr. Richards to find out and to aid in controlling or preventing a recurrence of the defect.

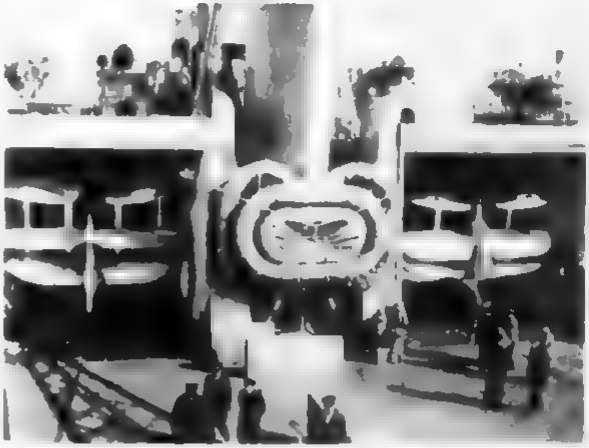
The sample was split open under sterile conditions and small slivers were removed. These were placed in small test tubes with a nutrient medium (an agar containing malt extract), upon which fungi will grow readily. From all of the slivers the same fungus grew and was thereupon assumed to be causing the

[*Continued on page* 120]

British Cruiser Has Hangars For Scouting Planes

A RECENT addition to the British fleet, *H. M. S. Sheffield*, a new class of cruiser, boasts armor-clad hangars to house the two folding-wing scouting airplanes with which she is equipped. The planes are mounted on slide-track platforms, enabling them to be removed from hangars and prepared for flight in a few minutes.

The new cruiser features armament consisting of twelve six-inch guns and eight four-inch guns, which are used for anti-aircraft defense. After trial runs, the cruiser will be attached to Britain's Second Cruiser Squadron of the Royal Navy.



Britain's new 9,000-ton cruiser, *H.M.S. Sheffield*, is equipped with armor-clad hangars to protect her two folding-wing scouting planes against heavy seas and inclement weather.

Dummy Piano "Plays" Silently

Silent practice is possible with this dummy piano, the keyboard causing "notes" to light up on the musical scale panel

SILENT piano practice is afforded by use of a new keyboard and panel recently developed The panel features a reproduction of the musical scale on which the notes are represented by small electric bulbs. When the pianist touches the keyboard, the panel bulbs connected to the struck keys become illuminated, enabling the pianist to check his playing without a note being heard.

Model Locomotives Exhibited

VALUED at $20,000, tiny streamlined trains, oil burners and electric "iron horses," were placed on exhibition by the National Model Railroad Association during a convention held in Los Angeles, Calif., recently. The exhibit consisted mainly of reproductions built to a scale of one-quarter inch to one foot and all were working models.

One of the models exhibited was a reproduction of an eight-wheel Denver and Rio Grande Railroad locomotive, which burns coal and develops 200 pounds steam pressure. Another model that created considerable interest was copied after the famous DeWitt Clinton locomotive which was in operation as early as 1831.

These models were placed on exhibition at a recent convention of the National Model Railroad Association. The large locomotive burns coal and develops 200 pounds steam pressure.

TREES that TRAVEL

by John Walker Harrington

Many mechanical devices, like the one shown above, have been developed to lift trees from the ground and tilt them so they can be loaded aboard trucks for transportation to a new site. Top photo—Soil must be closely held around the roots of trees while being transported, so the earth and roots are well protected by a burlap wrapping, reinforced by ropes.

TEN thousand full grown trees from here, there and everywhere are going to the New York World's Fair of 1939 to adorn and shelter its once naked site. They will each be from 30 to 50 feet high and about 25 years old, and supplying them is said to be the largest contract of its kind ever undertaken by nurserymen.

The massing of this vast leafy army is ample proof of the fact that this country now leads all other nations in the art and science of transplanting mature units of forest and grove. Skilled American engineers and forestry experts are daily uprooting and transplanting trees two and three times the size of those bound for the Flushing Meadows, and the United States Patent Office has on file scores of designs for ingenious devices for lifting these huge growths from Mother Earth and transporting to strange, new stances

The 1939 New York World's Fair site is being beautified with 10,000 trees moved from "homes" hundreds of miles away.

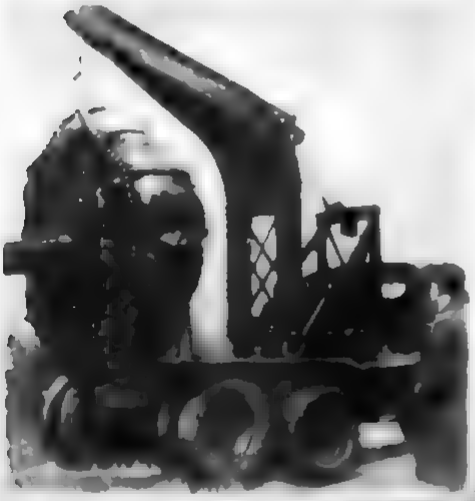
Top photo—To prevent bruises, the tree trunk is gayed in an upright position while the tree is removed from its hole by dragging it up an inclined runway dug from the hole bottom to ground level. Above—Having arrived safely at its new site, the tree is placed in a well prepared and spacious hole.

Transplanting even a nursery two-year-old embodies some risks, and to move a tree that is aged a quarter of a century or more is a capital operation for which the mature elm, oak, pine, or whatever it may be, has to be prepared if it is to withstand the shock. Months before the date of removal it is encircled with a shallow trench of about the same diameter as the spread of its branches. Small roots projecting beyond the circle are cut off, and frequently larger roots extending beyond the trench are dissected with pointed crowbars and preserved

The branches of the tree are then pruned somewhat so as to ease the strain of feeding them on the reduced root system This is done, of course, when the tree is still in winter sleep, which is Nature's anesthetic

The area edged by the trench is then undermined and the mass

Above—Undertaking a job of mammoth proportions, tree movers are transplanting [redacted] from five states on the Flushing Meadows site of the 1939 New York World's Fair. Below—Trees are transported horizontally on special trucks.



of earth and roots is tied up with burlap and braced with heavy timbers. The resultant bundle is known as the "ball" and, as the full grown tree must have plenty of its own native soil if it is to thrive in its new place, the balls for valuable trees may weigh as much as thirty tons, and whole growths tipping the scales at 100 tons are not uncommon.

Lifting the "patient" out of its old bed is done gently. The trunk is first carefully bandaged with burlap to prevent the bark from being scraped or injured, because any wounds on the "skin" lower vitality at a time when it is most needed. When well prepared, however, the bound tree can be efficiently raised by specially devised derricks, sleds, planks and rollers or by-ways which may be specially suited to the problem in hand, but in all cases the tree and its ball are coaxed along, not yanked up as if in the hands of an amateur dentist.

In the pioneer days of the art the trees were transported in an upright position or prone with branches first. Nowadays the ball travels foremost, the branches in the rear being closely bound to prevent interference with traffic. Many large specimens are loaded on gondolas or platforms of freight cars at a balanced angle so that they are thus able to easily negotiate bridges en route.

All the way from the old sites to the new, the migrating trees have to be nursed along, duly watered and kept from undue strains. The pits must be ready for them on arrival, and once lowered into position, they are tamped in quickly with rich earth which blends with that of the balls. The burlap

[*Continued on page* 118]

Transplanted to their new "home" on the site of the 1939 World's Fair, these dogwood trees have been temporarily braced by guy wires to prevent possible loosening of roots and soil by strong winds before they obtain a secure hold

Glass-Nosed Plane Constructed For Aerial Mappers

DESIGNED for use by aerial mappers and photographers, an unusual glass-nosed airplane has undergone initial tests at Marshall, Mich Constructed to plans drafted by Talbert Abrams, an aerial survey company official, the plane affords unobstructed forward and downward vision for both pilot and mapper.

The motor is mounted at the tail of the fuselage, serving to push rather than pull the plane through the air. Dual rudders are mounted on a boom extending from the rear of the fuselage

Featuring a glass nose, this airplane was designed for use by aerial mappers and photographers The motor is mounted at the rear. Note the tricycle type landing gear arrangement

Sand Yachts Provide Thrills

Plenty of thrills are provided for pleasure seekers who try their hand at navigating one of these sand yachts Steering and sail control are achieved by means of dual hand wheels

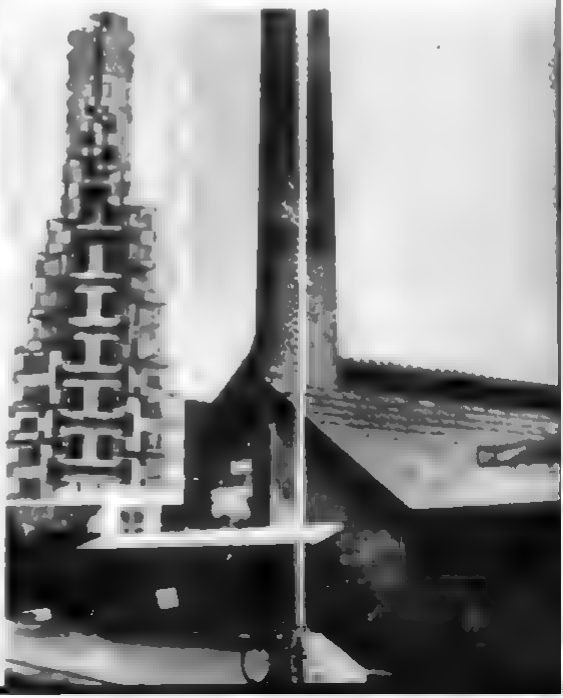
SAND yachting has developed into a popular sport with the pleasure seeking visitors at the beach resorts near Le Touquet, France. The "yachts" used in the sport consist of a simple chassis mounted on four automobile wheels, seats for four passengers being slung inside the chassis frame. A mast and sail are mounted at the front end of the chassis, sail and steering control being accomplished by two hand wheels

Chain Converts Into Girder

A COMPACT apparatus that transforms a specially made chain into a semi-rigid girder has been developed in Paris, France Michel Le Roy, an aviation mechanic who invented the apparatus, believes the device will be used as a radio antenna for tanks, submarines and railway signal towers

To operate the chain-girder device the specially constructed chain is passed through a metal bottle-neck by the turning of a control wheel. The design of the bottle-neck is such that it interlocks the parts of the chain which then emerges in the form of a semi-rigid girder. Turning the wheel backwards causes the girder to re-enter the bottle-neck, whereupon it again assumes a chain form

Developed in France, this apparatus transforms a chain into a semi rigid girder Insert shows how chain parts interlock



WHY AIRMAIL STAMPS ARE POPULAR

by Montgomery Mulford

AIRMAIL postage stamps have gained the attention of a large number of adults who collect stamps as specialists or for the purpose of investment. This group of stamps, the youngest in point of years of existence, has already revealed numerous adhesives which have spurted upward in value and in real historic interest. Astonishing values are realized with some of the stamps produced for airmail matter.

The 24-cent U. S. airmail stamp of 1918 with the center inverted has a catalogue value today of over $3,700. It is one of the airmail stamp classics of the world. Many U. S. airmail stamps, which are not errors, are steadily rising in price, too; in this category we find the 1930 airmails picturing Zeppelins. Scott's numbers 1313 and 1314 in particular. These two issues are priced the same, both used and unused!

[*Continued on page* 132]

A Jig Sawed Inlaid Lamp

by D. C. Marshall

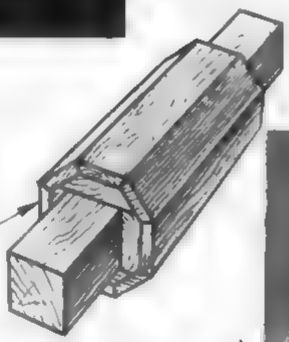
INLAYING in the usual manner on flat surfaces requires a lot of careful work, and inlaying on turned pieces such as lamp posts is almost impossible. Jig saw inlay opens up a field for unusual types of inlaying and it takes but a fraction of the time needed for the other type.

The lamp shown in the accompanying photograph is an example of such inlaying. The ship rides the waves of the sea and the waves continue entirely around the post of the lamp.

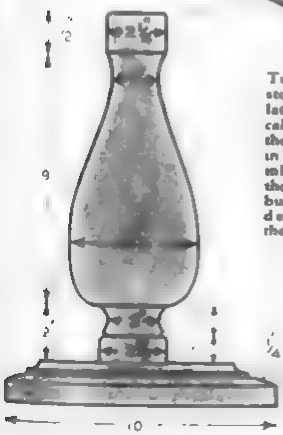
To make such a lamp, first secure a piece of dark wood such as walnut and build up the thick portion to a size 1

[*Continued on page* 120]

Inlay pieces of light and dark stock are cut out on a jig saw, then glued to form the [illegible] shown below. Post is turned to shape on lathe.



POST BUILT UP READY FOR TURNING



Turn the spindle stock to shape on a lathe, using dividing calipers for obtaining the dimensions given in details below. The inlay ship design in the lamp at right is but one of the many decorative effects that are possible

"SEA ROVER"-A

This miniat replica of the mous ships t sailed the s hundreds of ye ago makes an usual radio sole decorati

by Ralph T. Moore

FEW ship models suggest the adventure and daring characteristics of the Viking boats of a by-gone age. Few indeed are as simple to construct for the effect obtained and the "Sea Rover" will grace any radio or mantel with barbaric splendor

The first part to construct is the hull. Referring to plan, mark out the upper or top piece as shown on a piece of 1 by 4-inch wide stock. Then cut out the front for

Viking Ship Model

the figure-head. This may be made of several pieces if desired and is so illustrated. Glue this upper part to two pieces 1 by 4 by 15-inch long and saw out the shape on a band-saw. Saw the elevation first and the plan next. Knock off the bottom corners with a saw and wood rasp and then shape the bow and stern on a disc sander. Next cut out the figure-head and the two keel pieces, the former from 1-inch stock and the keel pieces from ½-inch stock.

Photo 1 shows the completed hull with the keel in place, this being glued and nailed. At this point the hull should be sanded very smooth, and the ½-inch hole drilled for the mast. Next carve the figurehead and taper the bottom to blend with the keel. Sand smooth and glue and nail in place as shown in Photo 3. Thus far it has been assumed that white pine be used in the construction, but if preferred, oak may be used, with the hull in natural finish.

The rudder pivot is next cut from a piece of metal or hard wood and fastened to the notch in the keel with woodscrews. Saw out the rudder and the tiller bar from ⅜-inch stock and sand to the shape shown Two small pieces are now glued on either side of the stem of the rudder and then these are cut down to form a round section. From light metal fashion the rudder bracket as shown and drill for brads. Drill a small hole in the top of the rudder post, which is a square section, and file a square hole in the tiller bar. Drive a pin into the rudder through the rudder pivot and assemble as shown in Photo 2. Taper a ½-inch dowel, as shown, insert a small screw eye 2 inches down from the top and glue the mast in to the hull, as shown in Photo 5.

Cut out 12 discs 1½ inches in diameter from ¼-inch stock and sand these to form a convex face, as shown in Photo 4. A piece of ¼-inch dowel with the ends pointed is used for the sail spar. From ½-inch stock, mahogany or walnut, fashion the standard into which the keel slips and holds the ship upright. At this point shellac the entire model and when

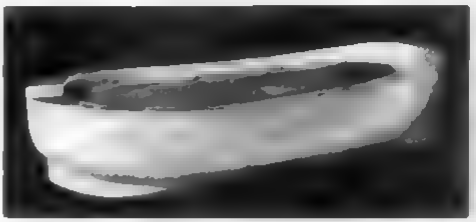


Photo 1.—The hull is built up from several pieces of pine stock, glued together, cut roughly to shape on a band saw Final shaping is done with wood rasp and power disc sander

Photo 2.—The rudder bracket is formed from a strip of light metal and mounted with brads. The rudder and tiller bar are both cut from ⅜-inch stock and sanded to the shapes shown

Photo 3.—Carve the figurehead and taper the bottom to blend in with the keel. Use 1-inch stock for this. Keel pieces are cut from ½-inch stock, sanded smooth and glued in position.

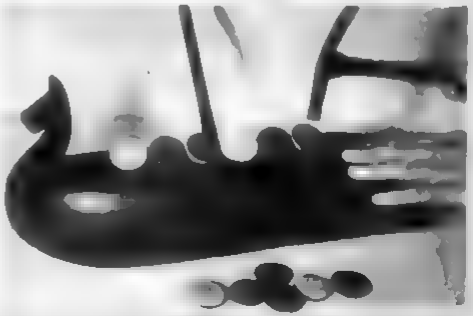


Photo 4.—Decorative shields, six on each side of hull, are cut from ¼-inch stock to a diameter of 1½ inches. Sand one side so that they assume a convex shape, then nail in place.

dry sand thoroughly. From linen or muslin cut out the sail and streamer to dimensions slightly larger than shown and seam the edges to receive No. 16 copper wire. The top seam in the sail is large enough to permit the spar to be inserted easily. Now paint the sail light gray and the streamer yellow. When dry, paint on the suggested designs or any other that suit your fancy. Paint the entire hull assembly dark gray. Paint the 12 shields in bold striking colors. Suggestions—yellow on blue and visa versa; black on silver; white on red. Then nail and glue these to the hull, as shown, touching up the nail heads with paint. Force the No. 16 wire in to the seams of the sail and wire the spar to the screweye on the mast. This is also done to the streamer; allow enough wire to project from both the sail and the streamer to fasten them in position. Shape the sail into a graceful billow and "wave" the streamer in a realistic fashion. Using bronze or aluminum paint, scribe the scales on the neck of the figurehead and paint the mouth red with white teeth.

With the model completed, construct a suitable cradle or stand for holding the ship in an upright position. Either pine or oak may be used, the latter being preferred if a natural finish is to be given the wood.

Cut out the base of the cradle from a piece of stock measuring 4 inches long, 2 inches wide and ½ inch thick. Round off the corners and sand smooth. The keel supports are quarter-round pieces, spaced ½ inch apart and screwed to the base from the underside. The accompanying plans show the base construction in perspective

Work carefully and you will have a model to be proud of, or a present that cannot fail to delight the receiver.

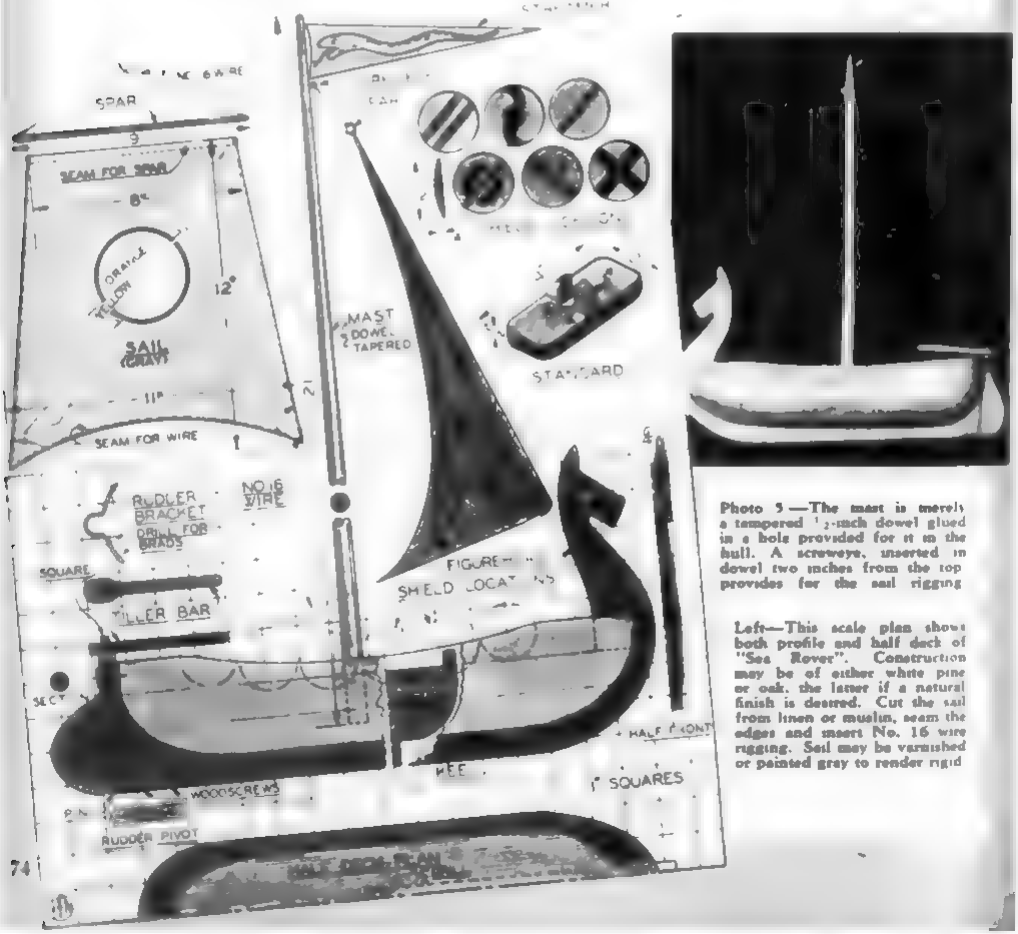


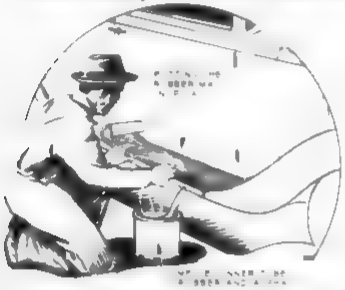
Photo 5—The mast is merely a tempered ⅛-inch dowel glued in a hole provided for it in the hull. A screweye, inserted in dowel two inches from the top provides for the sail rigging

Left—This scale plan shows both profile and half deck of "Sea Rover". Construction may be of either white pine or oak, the latter if a natural finish is desired. Cut the sail from linen or muslin, seam the edges and insert No. 16 wire rigging. Sail may be varnished or painted gray to render rigid

Original Ideas For Motorists

Wire Brush Cleans Brake Linings

THOUGH brake linings may squeak, slip or grab, this is no indication that they are worn out and have to be replaced. Very often the trouble is due to the asbestos fabric being worn smooth or glazed by a film of oil. To restore the brakes to their original condition, remove the wheels, brush bands briskly with a wire brush, then rub castor oil into fabric.—A. W.

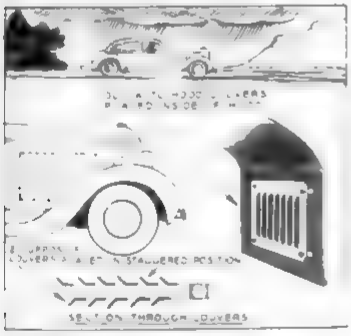


Inexpensive Running Board Cement

A CEMENT with lasting adhesive qualities can be easily made from melted inner tube rubber and asphalt. Cut up about two pounds of scrap inner tubing, place in a can and heat until the rubber melts into a sticky mass. To this add four pounds of paving asphalt and mix both thoroughly. Apply resulting cement in usual manner. — A. Tempe.

Fly Spray Makes Spring Painting Easy

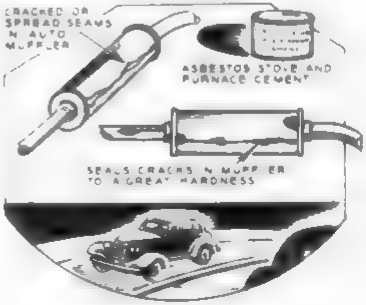
CAR owners will find that a periodical painting of the springs and underside of the fenders not only prevents rust, but improves the appearance of the auto. A fly spray, filled with thinned quick-drying asphalt paint, permits the painting to be done without difficulty.



Double Louvers Keep Motor Dry

DOUBLE louvers installed inside the car hood provide protection for the motor against rain and snow. Secure an old hood and cut out the louver section from each side. Drill corresponding holes in each corner of the resulting pieces and in the car hood, then mount with machine bolts on 1-inch pipe spacers Install louvers so that the vanes are staggered and face opposite direction from regular louvers.—Axel Ogren.

Furnace Cement Repairs Muffler



NOISE in the muffler can usually be traced to cracks in the metal case covering the inner baffles. These cracks are not only annoying but dangerous as well, since they permit obnoxious gas to escape and seep into the car A quick and lasting repair for damaged mufflers can be made with cement such as sold for furnace and stove repairing Cracks and seams can be sealed by applying cement with a flat stick or putty knife.—A. W.

How to Select

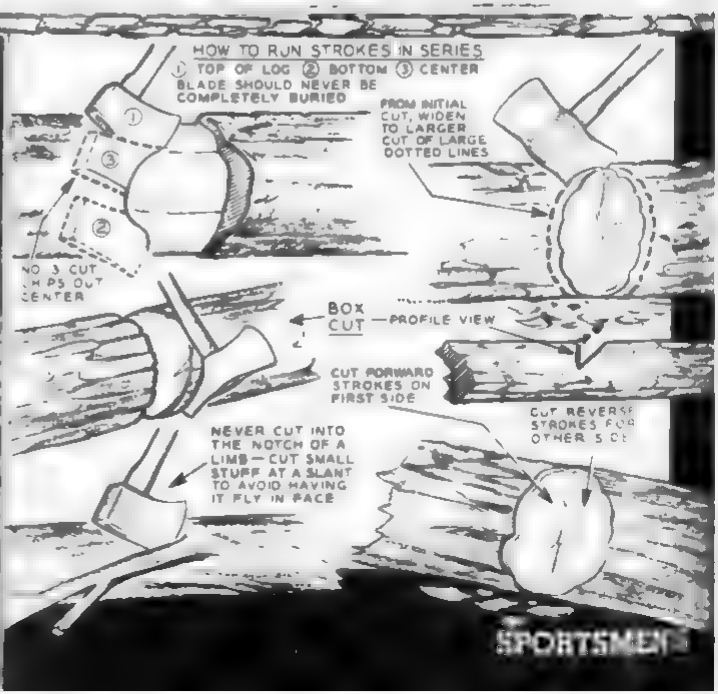
by James Emmett

LITTLE wonder the axe has been described as "that sweet American tool." For it is the winter breadwinner of many a backwoods farmer and indispensable companion to every trapper, hunter and woodsman the continent over.

To handle an axe correctly is an art well worth learning. Like most arts, pleasure comes with practice until the rhythmatic swing of a well selected, properly cared for tool is mastered. Handling it becomes a satisfaction, not to mention the healthful exercise also derived.

To get work done with a minimum of tiring effort, the axe must be selected for the job in mind. For instance, a weight intended for felling large trees would be a nuisance on the trapline, even by a guide who likes both his axe and ammunition on the heavy side. Likewise, a belt axe is regarded as a toy by the lumberjack.

Below—When cutting small logs into firewood, stand close behind them even if you are left handed. Grip the axe handle as shown.



and Use an Axe

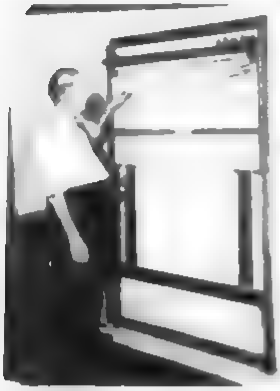
Professional choppers use the heaviest axes usually double-bitted. Years back, when big timber was plentiful, heads weighed 5 pounds and handles were 3 feet long. Today, with smaller trees, a 3½-pound axe handles faster on the trunks and chops limbs easier. Choppers use axes with two cutting edges for other reasons than because of their peculiar balance which makes swinging, up to a certain point, a pleasure. One edge can be thinned to razor sharpness for the fine work of felling and the other left duller and heavier for chopping off limbs. Or one edge may be used on hard and the other on soft woods.

The average man needs no larger than a 2½-pound head with a 28 or 30-inch handle, even for serious winter woodland expeditions. For summer work, such as cutting night wood,

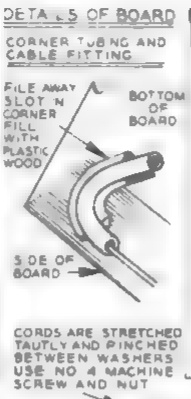
[*Continued on page 126*]

Right—To avoid mishaps, chopping should be done in a clearing so that axe does not catch on overhead branches. Below—Sharpen axe with a file commencing 3 in. back, working forward to ⅛ in. from edge.

A Folding Drafting Board

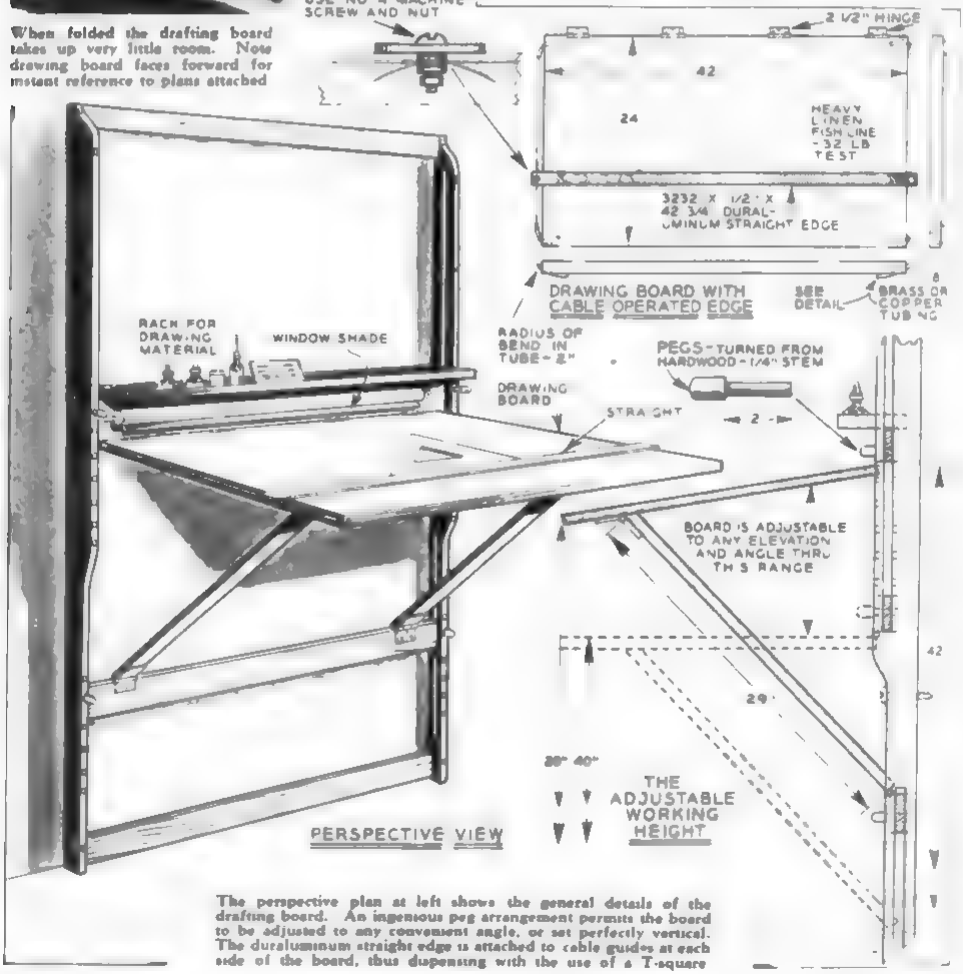


When folded the drafting board takes up very little room. Note drawing board faces forward for instant reference to plans attached



HERE is a drafting board which will appeal to the draftsman who must work in limited quarters; the engineering student with a dormitory room or home workshop enthusiast, who must budget every bit of space in his shop. As a drawing-board it is big and roomy, 24 by 42 inches, big enough so that most of the pieces entering into a home construction project can be laid out in full-size detail. Yet, when the occasion arises, the board and all its accessories can be folded up in a moment's time.

A commendable feature of this fixture is that, when folded, the drawing on the board



The perspective plan at left shows the general details of the drafting board. An ingenious peg arrangement permits the board to be adjusted to any convenient angle, or set perfectly vertical. The duraluminum straight edge is attached to cable guides at each side of the board, thus dispensing with the use of a T-square

FOR THE WORKSHOP

by Dick Cole

faces into the room. This is desirable to the home workshop fan who can readily consult the drawing for reference. A feature which will appeal to the student is that the board can be lowered to a table-like position only 27 inches high, a convenient height for typing.

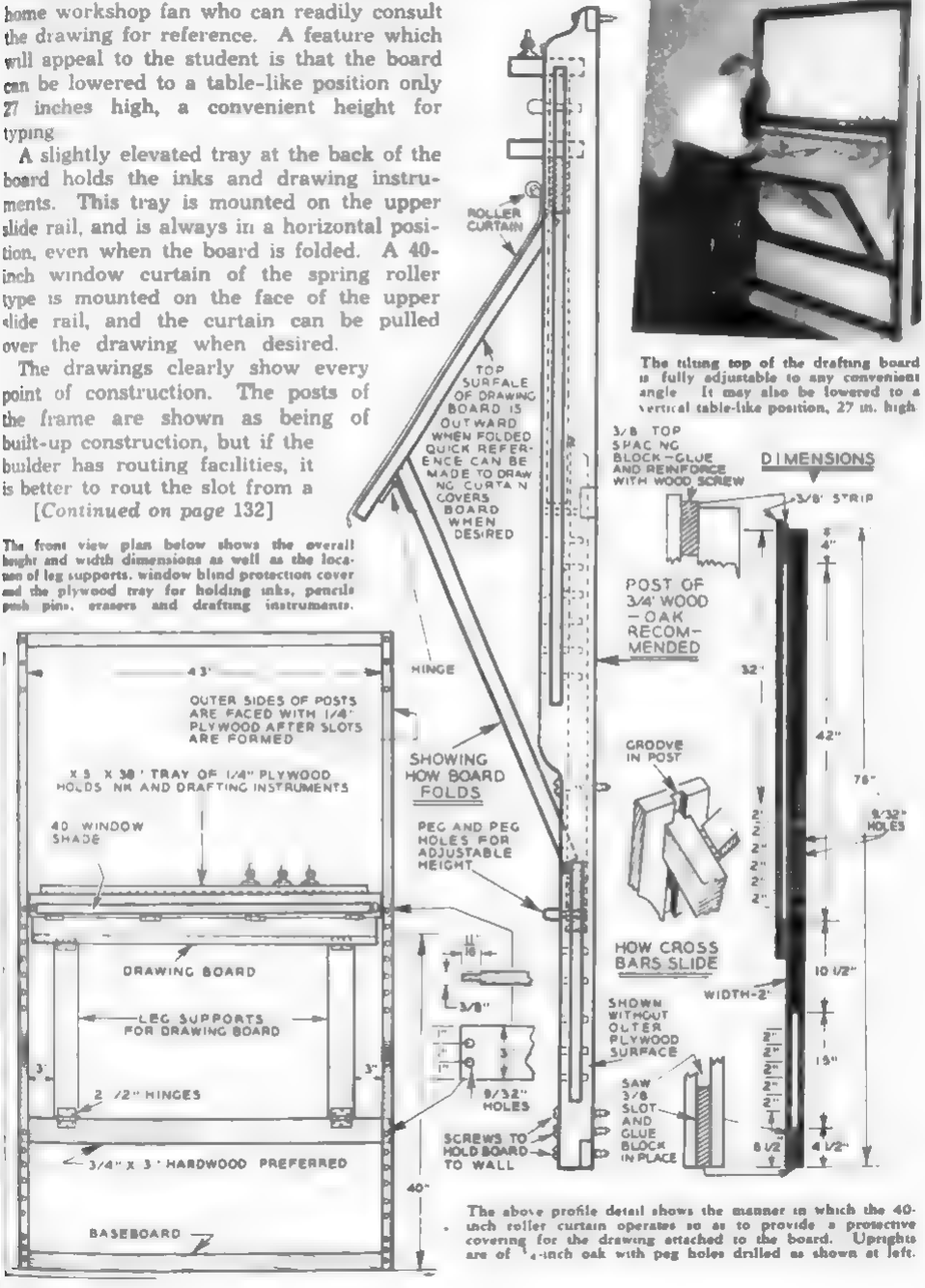
A slightly elevated tray at the back of the board holds the inks and drawing instruments. This tray is mounted on the upper slide rail, and is always in a horizontal position, even when the board is folded. A 40-inch window curtain of the spring roller type is mounted on the face of the upper slide rail, and the curtain can be pulled over the drawing when desired.

The drawings clearly show every point of construction. The posts of the frame are shown as being of built-up construction, but if the builder has routing facilities, it is better to rout the slot from a

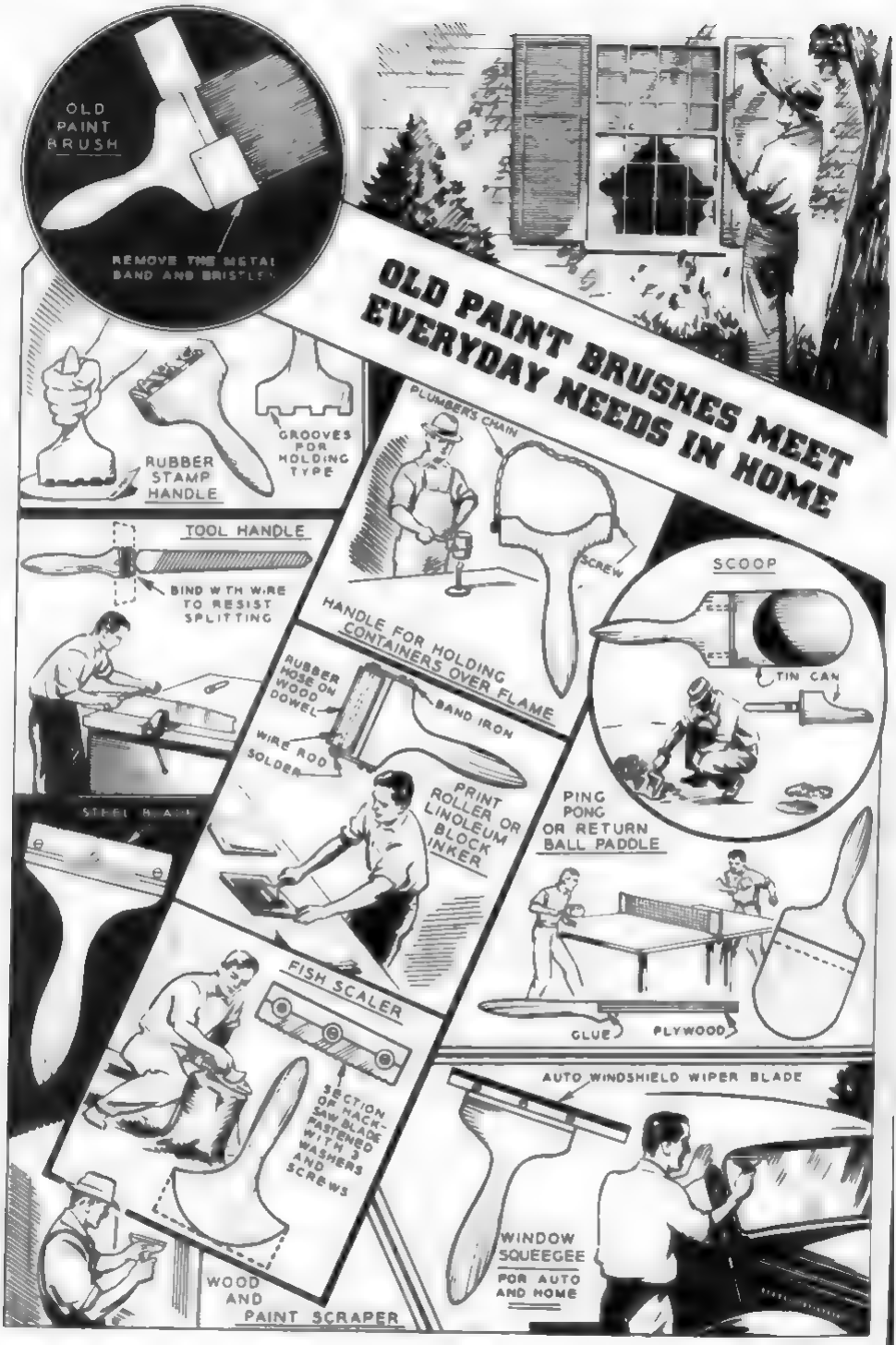
[*Continued on page* 132]

The tilting top of the drafting board is fully adjustable to any convenient angle. It may also be lowered to a vertical table-like position, 27 in. high.

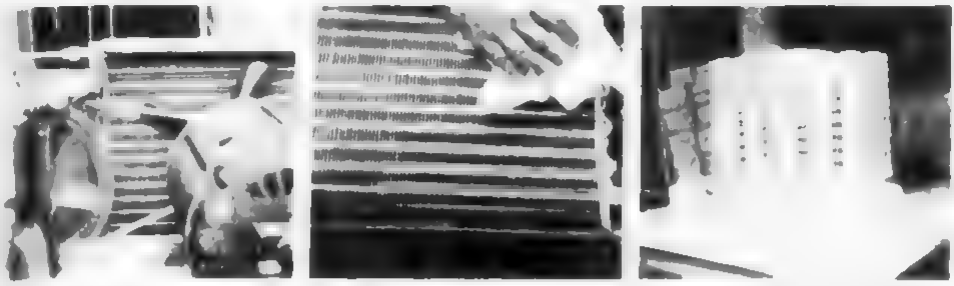
The front view plan below shows the overall height and width dimensions as well as the location of leg supports, window blind protection cover and the plywood tray for holding inks, pencils push pins, erasers and drafting instruments.



The above profile detail shows the manner in which the 40-inch roller curtain operates so as to provide a protective covering for the drawing attached to the board. Uprights are of ¾-inch oak with peg holes drilled as shown at left.

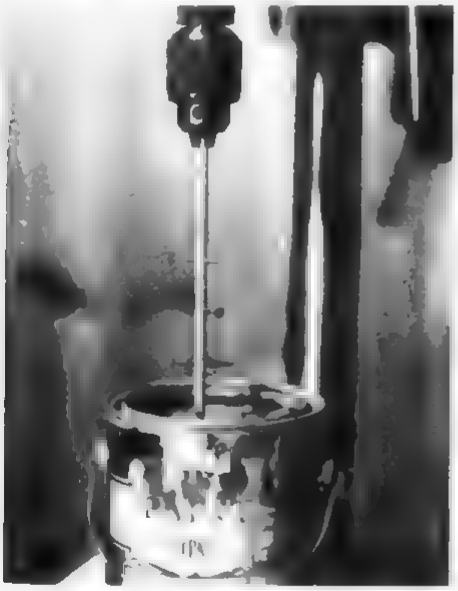

OLD PAINT BRUSH
REMOVE THE METAL BAND AND BRISTLES
OLD PAINT BRUSHES MEET EVERYDAY NEEDS IN HOME
RUBBER STAMP HANDLE
GROOVES FOR HOLDING TYPE
PLUMBER'S CHAIN
SCREW
HANDLE FOR HOLDING CONTAINERS OVER FLAME
TOOL HANDLE
BIND WITH WIRE TO RESIST SPLITTING
SCOOP
TIN CAN
RUBBER HOSE ON WOOD DOWEL
BAND IRON
WIRE ROD
SOLDER
PRINT ROLLER OR LINOLEUM BLOCK INKER
PING PONG OR RETURN BALL PADDLE
GLUE
PLYWOOD
FISH SCALER
SECTION OF HACK-SAW BLADE FASTENED WITH 3 WASHERS AND SCREWS
AUTO WINDSHIELD WIPER BLADE
WINDOW SQUEEGEE
FOR AUTO AND HOME
WOOD AND PAINT SCRAPER

CLEAN CONDENSER IMPROVES REFRIGERATOR



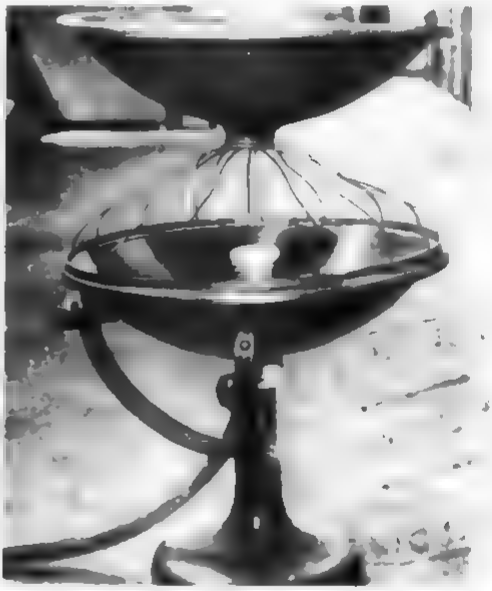
IN THE domestic refrigerator the condenser permits the circulating air to cool the liquid refrigerant. The heat transfer from the fins of the condenser to the surrounding air is carried out much more efficiently when the fins and tubing are not covered with dust. But because air is forced through the condenser, a large amount of dust becomes lodged in the openings and on the surface. To improve the efficiency of the unit, the surface should be brushed with a cloth. A vacuum cleaner connected up as a blower also works well

Drill Press Mixes Paint



THOSE who have tried to mix a gallon of paint after it had been standing in the can for a year or more know how much effort goes into the mixing process before it is ready for use. With the help of a power drill press, the job can be done in a few minutes. Simply hammer several nails through a wooden dowel, lock it in the chuck, and snap the switch. After about 15 minutes the paint is ready for use

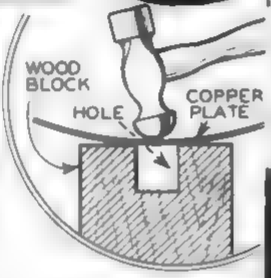
Extra Bowl Improves Heater



THE conventional bowl heater throwing heat in only one direction can be made to send its heat in all directions by mounting another bowl over it as shown in the photograph. A bowl taken from an old burned out heater is mounted on the wire guard parallel to heater reflector. With the heater pointed straight up, the additional bowl will cause much of the heat to be thrown out sideways

CRAFTWORK From Old

The plaque which this young lady is fastening to the wall is only one of the many easy-to-make designs produced with either a hand or power jig saw. Right—Hammered effects are obtained by placing copper on a hardwood block, recessed in the center, and pounding with either a ball peen hammer or a hard wood mallet.



ALMOST every print shop has somewhere a pile of old copper halftones, which are practically worthless except as so much old metal. They are really pieces of pure sheet copper approximately $\frac{1}{16}$-inch thick, tacked on hardwood bases.

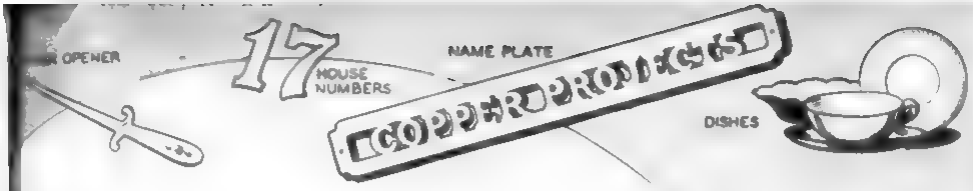
In the hands of enterprising home hobbyists these flat copper pieces may be transformed into a countless variety of beautiful and enduring things. Here are the instructions for sawing, hammering, soldering, bending, polishing and coloring copper, together with a few ideas on which to try your skill.

The copper can be sawed easily on a power jig-saw. Set the blade guide down almost against the material to minimize blade breakage. A little soap or paraffine on the blade will facilitate the sawing. When sawed on a power jig-saw, the cut will be smooth with practically no burr on the edge. Power sawing is much faster, too, than hand sawing. In many cases the design will be improved if you tilt the table and saw the piece with a bevel.

If sawing is done by hand, first cut a V-notch about 1-inch across and 2 inches deep into a 1-inch piece of hard wood. The wooden base from one of the halftones will serve for this. Fasten it with screws to the work-bench with the notched side projecting over the edge. Put the blade in the coping saw with the teeth pointed toward the handle, so that in sawing the cutting stroke is *down*. In this way you can sit at your bench and saw comfortably, placing the piece being sawed directly over the notch.

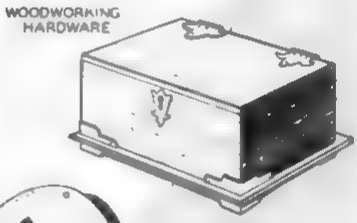
These pictures show the two methods by which old copper halftones may be cut into intricate shapes and designs. While a power jig saw will produce quicker and cleaner work, the hand saw is also practical.

Copper halftones may be formed into bowls and trays by hammering or "bossing" them as follows: Gouge or pound a spherical depression about 1½ inches across and ¾



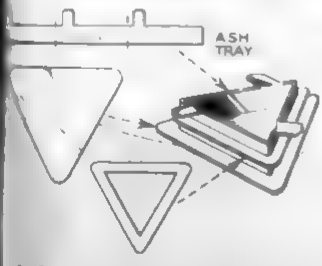
Copper Halftones

by Fred A. Beard



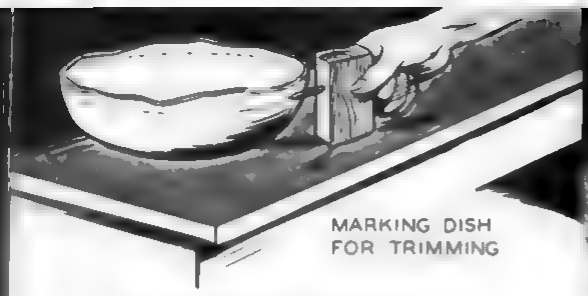
All of the novelties shown here were made from old copper halftones. Included in this group are a napkin ring, picture frame, letter opener, copper dish, name plate, wall plaque, ash tray, monogram and house numbers.

A few of the many uses for old copper halftones will be found in the sketches at left and above. These articles are simple to make.

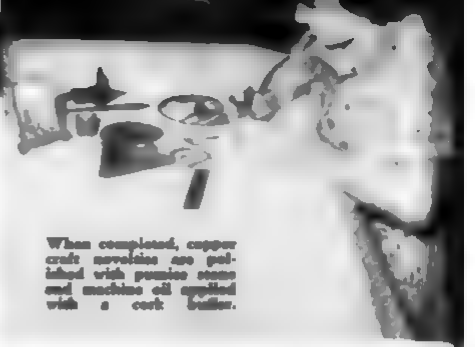


...ch deep in the end of a piece of hardwood. ...his piece should be about 3 inches square by ...or 5 inches long. Cut the copper into a disk ...the desired size. Lock the block of wood in ...vise, and lay the copper on top of the block ...th its center over the hollow. Strike it—...t too hard—right above the depression, ...th the round side of a ball pein hammer, or ...ther, with a small hardwood mallet having ...rounded face, which can be made for the purpose. Continue striking it, rotating the disk, and working the blows spirally around the center of the disk until you reach the outer edge. The disk will begin at once to assume a convex shape. Work patiently, keeping its shape always true, and concentrating the blows where the greatest curvature is desired. Always strike so that the blows fall directly over the center of the hollow, so that the copper may be stretched into it.

Copper hardens considerably when beaten and may have to be annealed or softened once or twice during the hammering process to



After beating a sheet of copper into bowl shape, trim off the irregular edge by marking the dish with a scratch-awl inserted in a block of wood.



When completed, copper craft novelties are polished with pumice stone and machine oil applied with a cork buffer.

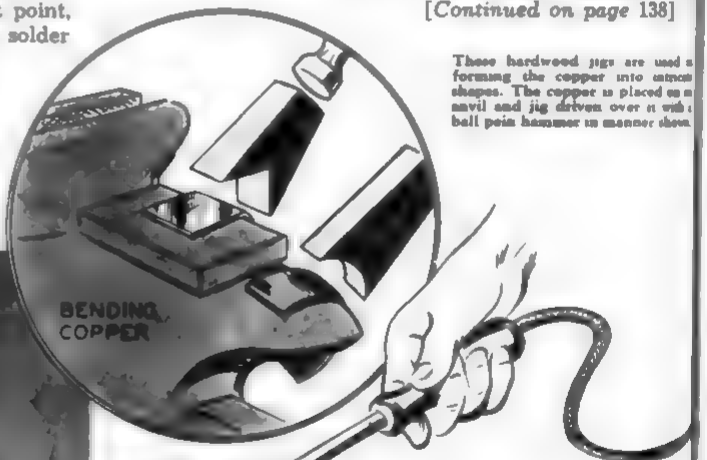
prevent it from cracking. This is done by heating the copper to a cherry red and plunging it into a "pickle" solution consisting of 9 parts of water and 1 part of nitric acid (Caution: Add the acid to the water.) This bath is to remove the scale of copper oxide caused by the heat, and should be kept in a glass or earthen vessel. Leave the copper in the bath until it becomes free from discoloration and rinse it before handling it again.

Soldering copper can be summed up in three simple but important requirements: (1) Surfaces to be soldered must be clean and bright; (2) a good flux must cover it wherever the solder is to be; (3) the object or area soldered must be hot enough itself to melt the solder. Most beginners fail on that last point, and wonder why the solder forms in little globes and falls off. If all three of those points are observed, the solder will flow like water right where you want it. A small torch is superior to a soldering iron, although a large soldering iron is better than a small one, which is not good at all except for soldering very small pieces.

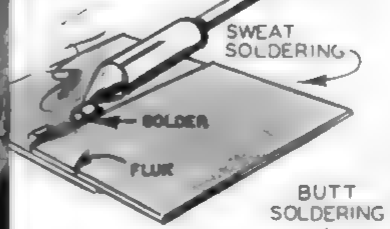
The different types of soldered joints as well as simple bends in the copper, which may be made by using the devices suggested, are shown in the sketches.

The screened face of the halftones may be removed with coarse emery cloth tacked on a wooden block, followed with

[*Continued on page* 138]

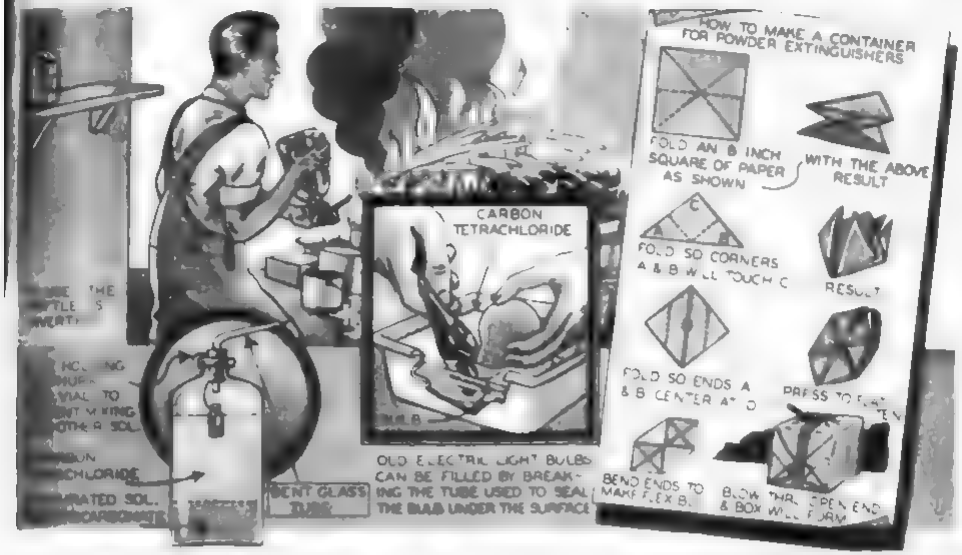


These hardwood jigs are used in forming the copper into various shapes. The copper is placed on an anvil and jig driven over it with a ball pein hammer in manner shown.



Too often craftsmen find their soldering jobs fail to hold because the metal itself was not heated to the same temperature as the soldering iron. To insure secure joints, preheat metal with blow torch as indicated

Fire Extinguishers for Shop and Home



These efficient liquid and dry fire extinguishers cost little to make and provide the home and shop with an assurance of safety. At right is shown a self-energizing extinguisher; center, a light bulb type and at right, containers for dry extinguishers.

FIRE extinguishers are important accessories that no home or shop should be without. They may be prepared in either liquid or powder form, both having equal effect on a blaze. Carbon tetrachloride, commonly used as a household cleaner, will instantly smother a fire, as will dry mixtures of sodium chloride, ammonium sulphate and sodium bicarbonate.

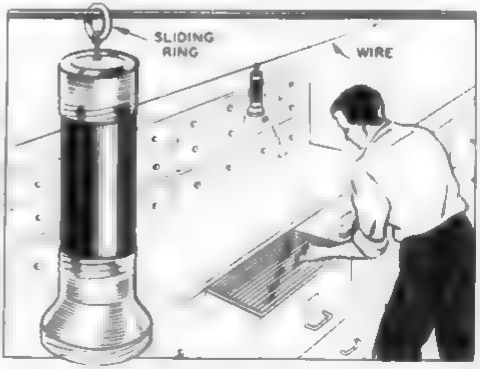
Burned-out electric light bulbs serve as excellent containers for the carbon tetrachloride. Remove the brass shell from the bulb by heating over a flame, submerge the glass envelope (when cool) in a pan of carbon tetrachloride and break the seal on the bottom of the bulb with pliers. Breaking the seal will cause the solution to be forced into the bulb by atmospheric pressure, after which the hole may be plugged with wax. Thrown on a fire, the bulb will shatter, releasing the carbon tetrachloride.

A spray extinguisher, operating on chemical reaction, can be made from a large bottle fitted with a glass tube stopper. Into the bottle is poured 1 part saturated solution of sodium bicarbonate and 2 parts carbon tetrachloride. Fill a perfume vial with sulphuric acid and suspend to cork as shown. Inverting bottle will cause chemicals to mix and shoot out through the glass tube.

Powder extinguishers can be made by mixing 6 parts sodium chloride, 6 parts ammonium chloride and 8 parts sodium bicarbonate and packing in containers as shown.

Sliding Stock Room Flashlight

WITHOUT going to the expense of installing numerous fixed lights throughout length of stock room, illuminating interiors of long rows of deep drawers and bins may be done by stretching a wire overhead, parallel to shelving, and suspending a flashlight from wire, by means of sliding ring.



The "Old Army Game"—a spectator places a pea under one of the walnut shells the magician shuffles them and asks under which shell the pea is hidden. Although he watches every movement of the "right" shell, the spectator will be surprised find the pea under another. These steps show how the trick is performed. Lat... How to pick a card selected from a shuffled deck by a member of the audien... without actually seeing it. This simple card locating stunt has unlimited applicat... By careful manipulation it can be used in drawing several cards picked at rando...

FUN WITH

by Colin K. Cameron

SUCCESS in the field of magic comes from a combination of such elements as the magician's skill and experience, his hours of practice with perfect apparatus and his native endowment in the art of *misdirection*—the ability to properly distract the attention of an alert and observant group of people. In other words, it isn't so much the trick itself that counts toward the final effect as it is the ability of the one who shows it.

This is particularly true in the presentation of "pocket magic," that intimate type of trickery into which classification practically all of the simpler stunts fall. They are called pocket tricks because any apparatus needed can be carried easily in the pocket and used repeatedly with little or no preparation.

The basic secrets of these pocket tricks are usually so simple as to be ridiculous. They require no sleight-of-hand or other unusual skill, but depend mainly upon the blank calmness of the illusionist. Thus to excel in the presentation of this close-up type of magic, you must learn to assume that "Why I wouldn't deceive you for the world!" expression at will. If you can do this and a...

the same time accomplish the few simple moves that are necessary in each trick, you'll probably succeed.

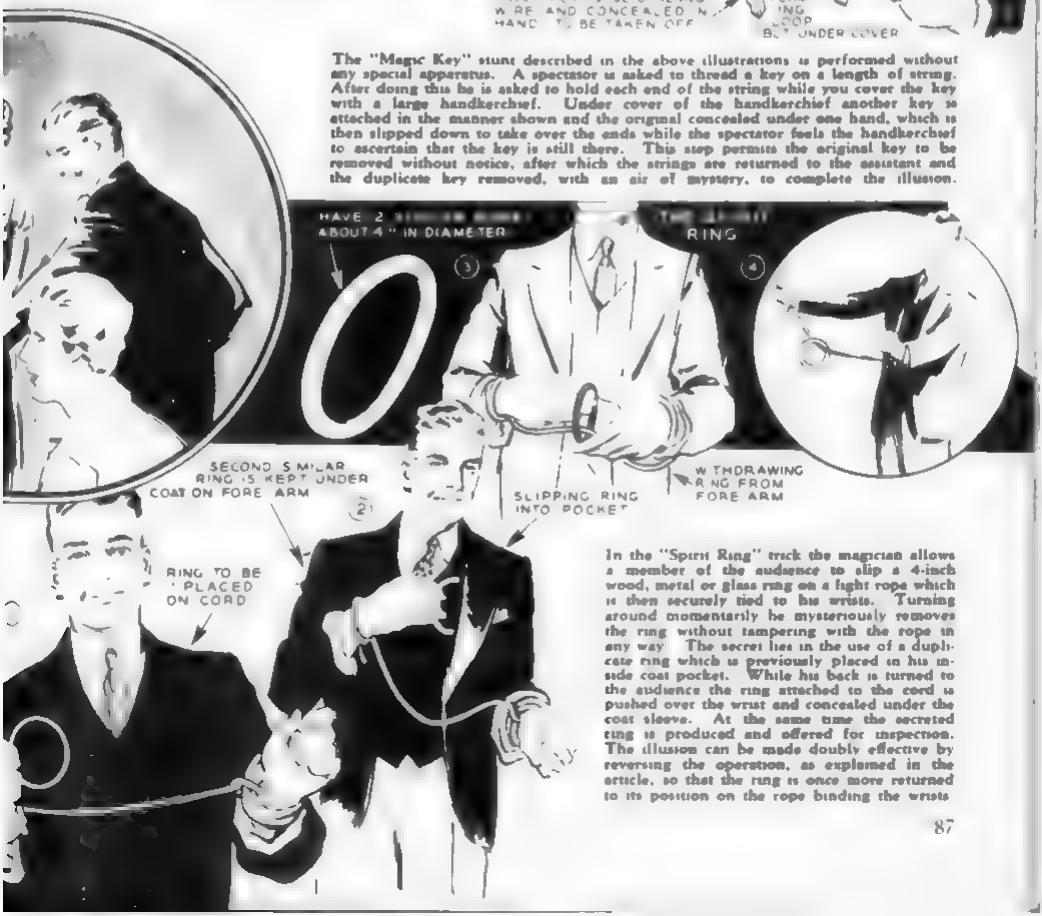
Take, for instance, the "old army game" which you may know better as the shell game. The performer shows three walnut shell halves and a pea. He openly covers the pea with one of the shells, then moves the three around on the table in such a manner that you are sure you can follow his every move. When he asks you to point out the shell covering the pea, you always know which one it is.

You do—until the betting starts, but from then on you don't seem to be nearly so adept at following the movements of the shell with the pea. In fact, whenever you are sure that

[*Continued on page* 130]

POCKET MAGIC

The "Magic Key" stunt described in the above illustrations is performed without any special apparatus. A spectator is asked to thread a key on a length of string. After doing this he is asked to hold each end of the string while you cover the key with a large handkerchief. Under cover of the handkerchief another key is attached in the manner shown and the original concealed under one hand, which is then slipped down to take over the ends while the spectator feels the handkerchief to ascertain that the key is still there. This step permits the original key to be removed without notice, after which the strings are returned to the assistant and the duplicate key removed, with an air of mystery, to complete the illustration.



In the "Spirit Ring" trick the magician allows a member of the audience to slip a 4-inch wood, metal or glass ring on a light rope which is then securely tied to his wrists. Turning around momentarily he mysteriously removes the ring without tampering with the rope in any way. The secret lies in the use of a duplicate ring which is previously placed in his inside coat pocket. While his back is turned to the audience the ring attached to the cord is pushed over the wrist and concealed under the coat sleeve. At the same time the secreted ring is produced and offered for inspection. The illusion can be made doubly effective by reversing the operation, as explained in the article, so that the ring is once more returned to its position on the rope binding the wrists

"The Silent Sherlock"

In order to obtain clear fingerprint impressions, a applicator plate must be used. On it is placed a smal amount of printer's ink which is rolled out with a roller made from a length of rubber tubing slipped over a wooden dowel. These photos show the correct way to ink the plate and make fingerprint impressions.

NOTHING grips the interest more quickly today than to read of the marvels of scientific crime sleuthing. The famous fictional detective of a bygone generation, with his calabash pipe and peaked cap, his magnifying glass and numberless changes of costume, has made way for the quiet and unassuming laboratory technician: a man who never goes afield to stalk his prey but who toils through the day and often through the night, bent over microscopes and other modern instruments, patiently accumulating the most damning and positive types of evidence, the kind that no amount of legal pyrotechnics can controvert.

An unromantic and prosaic figure? Not at all! Trained in special schools, he applies the latest discoveries of science. He it is who, with enlarged photomicrographs of bullet scratches made through the ingenious comparison microscope, presents to juries the indisputable evidence that the projectile taken from the body of a homicide victim was fired from the same revolver as that found on the person of the accused. He it is who clearly demonstrates that the signature on an important contract is a forgery, that a particular specimen of thousand-dollar bill is counterfeit and that a certain claimant to an estate cannot possibly be the long-lost daughter of the deceased since his blood tests deny such relationship. Unromantic? Hardly!

Anyone who has a bent for investigation and the capacity for taking pains can become proficient in at least certain aspects of this work, notably in phases that do not require an elaborate setup of expensive equipment.

Fingerprint Mysteries Revealed Under The Microscope's Lens

by Julian Corrington, Ph.D.

Set up your own criminology laboratory and discover how the modern G-man gets his clues through a microscope.

To "take away" fingerprints from an article having a smooth surface, use a piece of Cellophane "scotch" tape and powdered graphite. Make the graphite powder by rubbing a soft lead pencil on fine sandpaper. Sprinkle powder over fingerprint, dust off excess and press tape over it. Carefully remove the tape, with fingerprints affixed to it, and mount on a white calling card. Cards may be filed under proper classification.

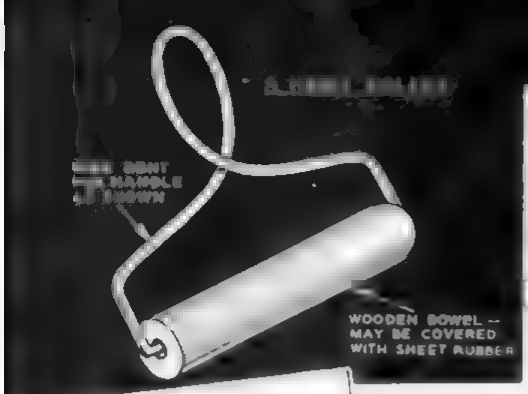
With hardly any outlay you can rig up your own criminological laboratory and work out all sorts of ingenious and fascinating problems.

Oldest and most basic of all devices in scientific criminology is the use of fingerprints in the identification of suspected persons. Everyone knows how extensive, how important and how positive this system has become, and that all large police offices maintain files of fingerprints of anti-social persons. But how many know in what ways the fingerprint set of one person differs from that of another; how it is that a police clerk can locate, out of files containing hundreds of thousands of record cards, a given set of prints in less than five minutes; or the growing use of the system in fields other than that of crime detection?

Large corporations, banks, and many other employers use fingerprints as a check on personal identification; masses of illiterate native laborers sign their pay vouchers with their thumb or their finger tips; the Army and the Navy rely on this, the only positive method of establishing identity. If you are one of those who cashed his recent bonus check, you know what you had to do to get your money!

The whole matter is of such general interest and importance that a voluntary movement is under way in this country to secure the fingerprints of everyone. All of us should know something about them; what they are, how they are made and especially how they are used. In every case that has come to our attention, members of state and city police departments have been very helpful and obliging in demonstrating the taking of a set of prints and in explaining the system by which they are filed.

We believe that if this subject should interest you particularly you will receive val-



the impression is to be made, then again apply the thumb in the same manner, left edge first, rolling swiftly across to the right edge, and lighting away cleanly. The pressure in each case is firm but not excessive so as to avoid smudging. One can do this for himself, but better results will be obtained by having someone else act as the operator. A little practice soon brings perfect results.

This first thumbprint goes in the upper left

This photomicrograph shows one of the four types of fingerprint patterns, the "arch." About 5 per cent of all prints come under this classification

The photomicrograph at left shows the "loop" pattern. The ridge count along the line drawn from delta to point of core, which in this case is the staple, is 18. The "whorl" pattern in photomicrograph at right shows two deltas at lower corners

uable assistance from your local authorities.

Human fingerprints represent impressions of alternately elevated and depressed areas in the skin (hills and valleys) which are but vestiges of well developed friction ridges on the palms and soles of our remote ancestors and related mammals. These ridges always run at right angles to the slipping force and are designed to prevent skidding, hence they are exceptionally notable in climbing species. Use of these prints in personal identification depends entirely on the fact that no two sets are ever exactly alike.

A metal, marble or plate-glass slab is smeared thinly with black printer's ink and smoothed with a rubber roller. This is an inexpensive item at any stationery or photography supply store, or one may use an old typewriter platen. Sheets of white bond paper or, preferably, blank white filing cards, may be used to make the records.

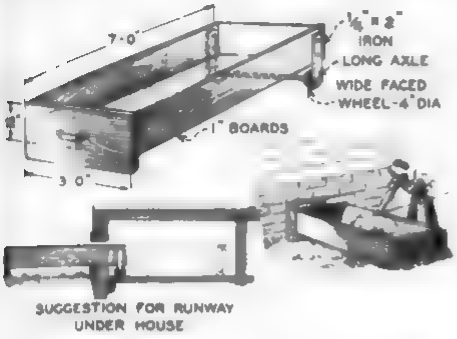
The operator grasps the right thumb of the subject with both hands and applies it to the inked slab, beginning with the left edge of the thumb and rolling this member over to its right edge, then lifting away quickly and cleanly. Still holding the thumb, carry across to a point just over the space on which corner of the card or sheet. Remaining digits of the right hand are next done by the same method and in their proper sequence then those of the left hand, thumb first. These are termed *rolled* prints and a glance at one of the accompanying illlstrations will make clear the placement of these separate, rolled impressions. Next comes a second set of *plain* prints, placed beneath the rolled set as a check on their sequence. The left hand goes first this time, at the lower left quadrant of the card, all four fingers pressed simultaneously without rolling. Then comes the four fingers of the right hand in the opposite quadrant and finally the two thumbs together in the center.

In police work it is customary to add data as to age, sex, height, weight, color of hair and eyes, description of other physical characteristics and the subject's signature.

Pioneer work on the classification of the hundreds of thousands of recorded fingerprint patterns was done by the great English biologist, Sir Francis Galton, cousin of Darwin and founder of the biometrical method of studying human inheritance. His scheme was perfected and elaborated by another

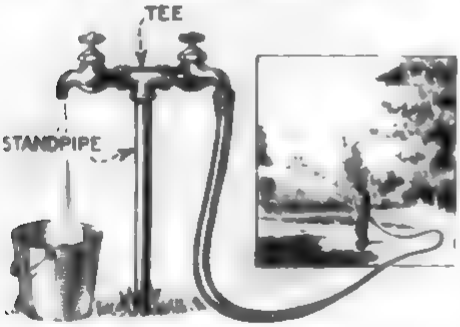
[*Continued on page* 140]

Sliding Box Under House Holds Garden Tools



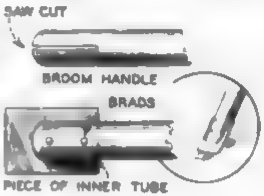
A SLIDING box under the house is a convenient place to store garden tools, and removes the necessity for going into the cellar to get each tool wanted. The size of the box may vary with the size and quantity of tools to be stored. The hole through the foundation is made in the same manner as though for a window. The wheels should be mounted on the box after it is in place. A door could be fitted over the opening to remove any possibility of rain entering the box. The ground should be leveled off where the box will rest after it is pulled out.

"T" Joint Improves Hydrant



WHEN the yard has but one hydrant which must be used for supplying water for various purposes as well as for the garden hose, the arrangement shown in the drawing will prove to be a great convenience. A "T" connection placed at the top of the pipe riser makes it possible to connect a faucet at each end. With two connections, the hose need not be disconnected each time the faucet is needed for filling a pail of sprinkling can with water. If the hose is in use and water is drawn from the other faucet, the hose need not be turned off as the water will flow more readily out of the other connection.

Rubber Increases Broom Use

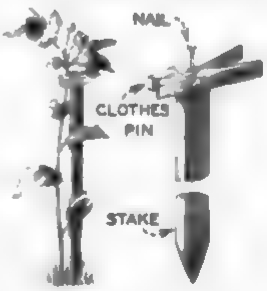


A FLAT piece of rubber fastened in a slot at the end of the broom handle will improve the usefulness of the broom considerably. The rubber can be cut from an old inner tube. The size may vary to meet the requirements of the work to be done. This device is particularly valuable for removing material stuck to the floor, on which the broom bristles have little or no effect.

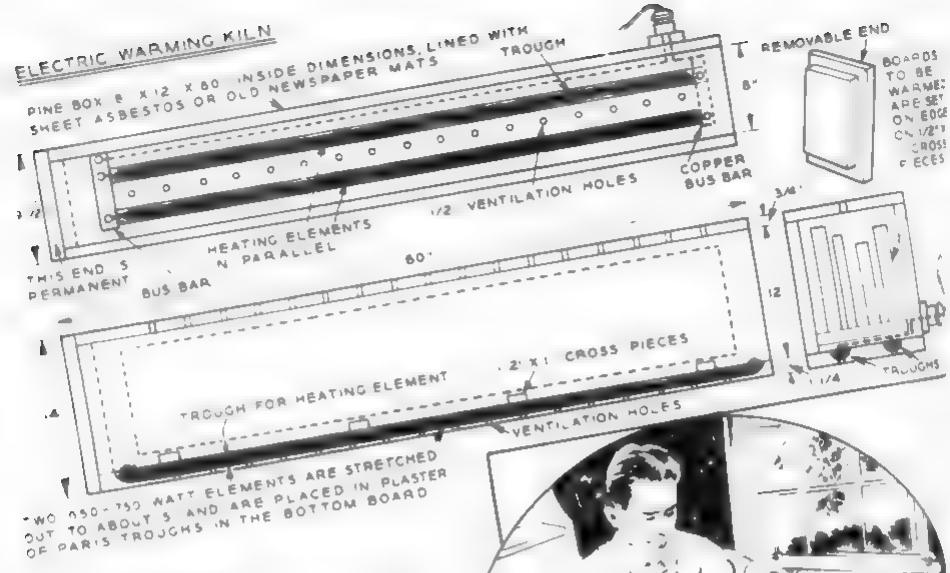
Extra Screw Eye Holds Hook

WHEN a screen door using a hook is in use, the hook often swings out between the door casing and door jam, thus holding the door slightly open or damaging the edge of the door. This annoyance can be eliminated easily by having another screw eye fastened to the door into which the hook can be placed when not in use.

Clip Supports Flower Stems



WHEN flower stems are very delicate, each puff of wind either bends them seriously or breaks them off. By mounting a spring clothes pin at the end of a short stake, complete support and protection will be given the flower

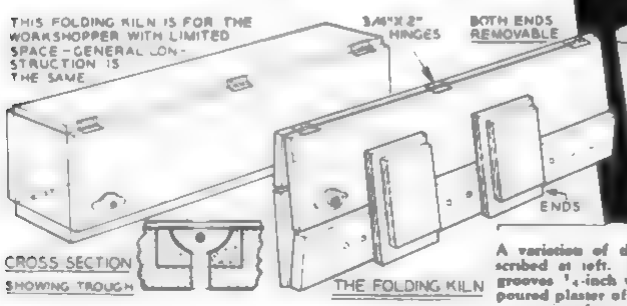


To insure a secure glued joint, the wood should be heated in a kiln as illustrated at right. A home-made device of this type is described in the details above. Heat is provided by uncoiled resistance units inserted in plaster of Paris troughs running along the bottom of the box. Kiln is insulated on sides and ends with heavy sheet asbestos.

GLUE is associated with wood-working jobs as closely as lubricating oil is to an automobile. And, just as many motorists are careless with their lubrication, so many cabinet workers are careless with their gluing. In either case the job does not stand up under usage.

Here are a few tips which will aid the amateur craftsman to glue up his jobs for permanency.

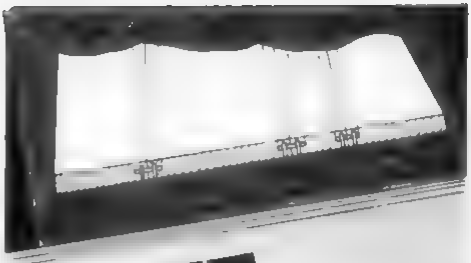
Ready-prepared, cold glue will serve very well for many small jobs, but for big glued-up jobs such as chests, table-tops, bureau-tops and the like, a good grade of hot, boiled cabinet glue is unsurpassed. However, the adhesive quality of hot glue is greatly im-



A variation of the permanent kiln is the folding type described at left. The bottom is routed to provide panels grooves 1/4-inch wide and 1/4-inch deep. Into the grooves poured plaster of Paris which is molded with a 1/4-inch dowel to receive heater wire taken from a bowl heating unit.

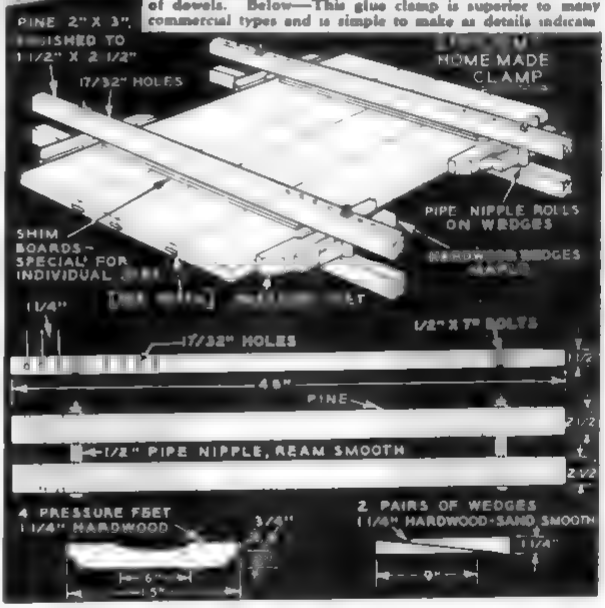
paired if it is applied to a cold surface. Even though the job is quickly clamped up, a portion of the glue will have congealed, and it can not be squeezed to a thin, microscopic film necessary to provide a good hold. When hot glue is used the pieces to be glued should be warmed to at least 150 degrees; a higher temperature is even better.

A simple means of warming up stock to be glued is through the use of an electric warming kiln which can be made



HOW TO TURN OUT GOOD GLUED-UP JOBS

Above—Substitute joints can be made with duraluminum strips if stock is too thin to warrant use of dowels. Below—This glue clamp is superior to many commercial types and is simple to make as details indicate

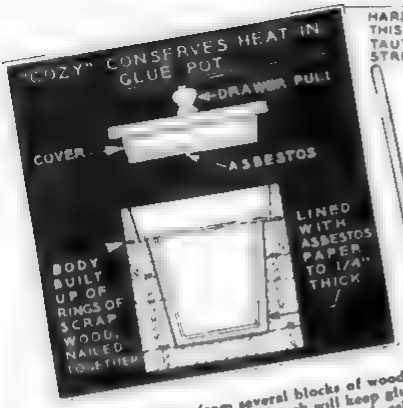


cheaply by any home craftsman It consists merely of a wooden box with inside dimensions about 8 by 12 by 60 inches with an opening at one end. The inside is lined with several thicknesses of asbestos paper or better still, with sections of discarded newspaper mats. These possess excellent heat insulating properties, and are tougher and stronger than asbestos paper All sides of the box, except the bottom, are of ¾-inch lumber of any kind. The bottom is 1¼ inches thick, with two grooves about ¾-inch wide and deep cut lengthwise on the inside surface.

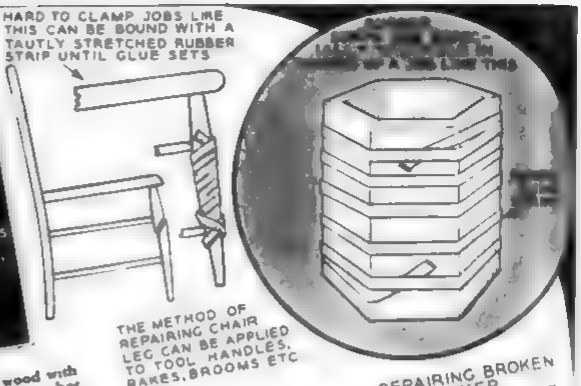
If routing or dadoing facilities are available, the cutting of the groves is an easy matter. Otherwise the grooves can be formed by making a built-up bottom.

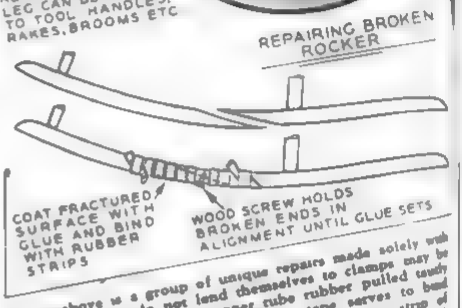
Plaster of Paris is poured into the grooves. Before the plaster has set firmly, a ⅜-inch rod is pressed into it to form a semi-circular trough. The heating elements rest in these plaster troughs, as shown in the accompanying illustrations. The 650 to 750-watt replacement elements can be bought at any electrical supply store. The kind used on reflector type heaters is best. These can readily be stretched out to reach between the two sheet copper bus-bars. When stretched, the wire will not glow as brightly as when close wound, but the actual amount of heat released is the same. After the elements are in place, the bottom is covered with asbestos paper or mats, perforated immediately above the troughs. Rows of small holes in the top and bottom of box permit circulation. Otherwise the heat generated would be confined to the lower part of kiln.

It will be seen that the boards are placed on edge in the kiln, resting on ½ by 1-inch cross-battens. Fifteen minutes is usually sufficient to warm up 1-inch stock for gluing When hot air emerges freely from the top

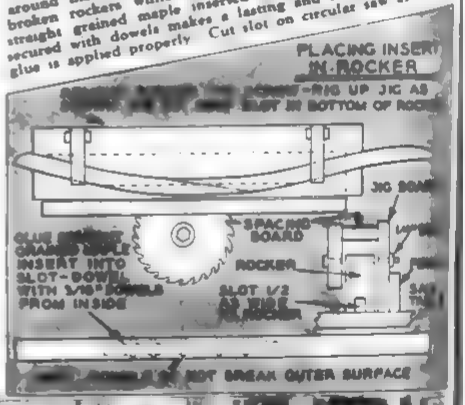


A glue pot "cozy" made from several blocks of wood with a circular cut made in the center of each will keep glue hot for as long as five hours. "Cozy" is lined with asbestos paper and fitted with a tight lid so that heat is retained.





Shown above is a group of unique repairs made solely with glue. Jobs that do not lend themselves to clamps may be secured with strips of auto inner tube rubber pulled tautly around the glued members. Friction tape serves to bind broken rockers while glue is drying. Below—a strip of straight grained maple inserted in slot cut in rocker and secured with dowels makes a lasting and invisible repair if glue is applied properly. Cut slot on circular saw as shown.



holes, these can be covered with a board and the current switched off. The kiln will conserve its heat for an hour or more.

The home shopman with limited space may find a folding kiln more suitable to his needs. The basic construction of this is the same as in the rigid kiln, except for the hinged arrangement. When folded it takes up very little space as indicated in the details.

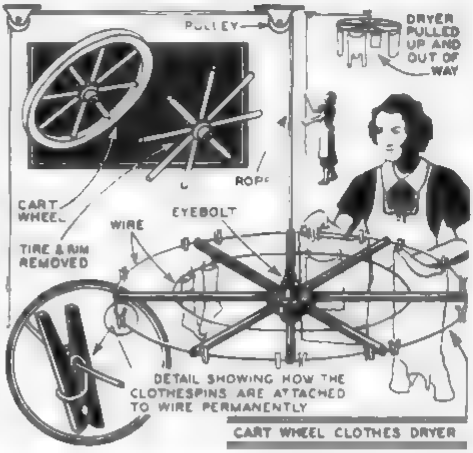
Many amateur craftsmen lack suitable clamping facilities for big glued-up jobs, like table-tops, and must resort to make-shift means. The homemade clamps shown are as efficient as any "patent" clamps on the market; better, in fact, than many. They hold the job absolutely flat while the glue is setting. The construction of these clamps is obvious and needs no explanation. When setting the wedges, swing a hammer in each hand and hit the wedges simultaneously. Note particularly that the pressure feet employed tend to distribute the pressure evenly over the surface.

For a glued-up job of everlasting permanency, apply the method shown at top of page 93. Of course metals other than duraluminum can be used, though it is suggested because of its lightness and strength. Matched grooves can be cut on the circular saw, and the metal driven to a tight fit in the grooves. The pins are driven in from the under side after the glue has set. This job

[*Continued on page* 128]

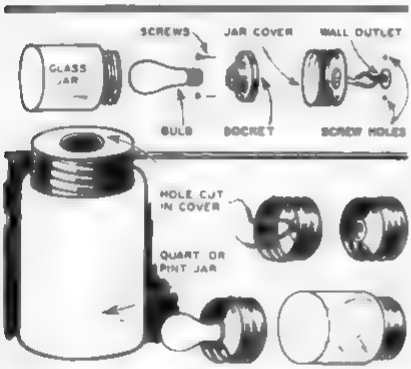
A Novel Clothes Drier For Porch Or Basement

WHEN a small clothes drier is necessary about the house, the arrangement shown in the drawing will prove especially useful. An old cart wheel is used with the rim and tire removed, leaving only the hub and spokes. A slot is cut in each spoke a short distance from the end and another at the end. Clothes line wire then is inserted in each slot around the wheel, resulting in two circles of wire on which the wash may be hung. Before placing the wire in position, fasten two clothespins between each spoke as shown. A screw eye is fastened to the center of the hub, making it possible to hang the entire arrangement from the ceiling. The drier can be lowered when the clothes are to be hung, and raised up out of the way while they are drying.



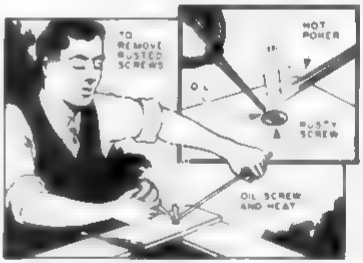
Glass Jar Protects Outdoor Bulb

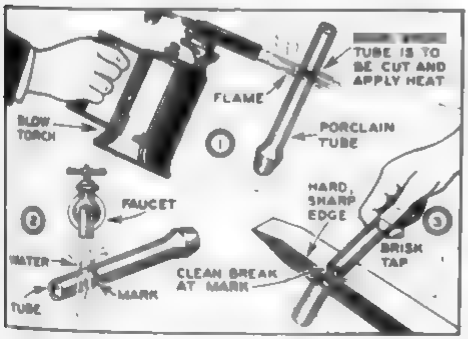
A GLASS jar mounted over an outdoor bulb offers considerable protection against it being broken accidentally. The size of the jar to be used will depend on the size of the bulb it is to protect. Cut a hole through the jar's cover to permit the connecting wires to pass through. Then mount a standard wall or ceiling socket in the cover. Mount the cover and socket to the wall and connect to the power source. The bulb is placed in position in its socket and the jar then is screwed into its cover.



Heat Speeds Rusty Screw Removal

MANY times it is quite a task to remove rusty screws without the danger of twisting off the head. A simple way to overcome this difficulty is to pour a small quantity of oil over the screw and to heat the screw with a hot iron. After the screw has become heated, it is usually a simple matter to remove it.





How To Cut Porcelain Tubes

A DEPENDABLE method of breaking porcelain tubes at the correct point and without leaving jagged edges will prove very useful to the householder and technician. First mark the tube with a three-cornered file at the correct spot. Then heat the point marked, with a blow torch. Be sure to revolve the tube while the flame is being applied. When the tube has become very hot, place it in a pan of water or under the faucet at the point marked

A group of bottle cork characters may be turned in shape from a single piece of wood, then cut apart as photos show. Make them from either pine or maple

Turn the bottle corks to shape from spindle stock 1 to 1½ inches in diameter following the squared pattern suggested above. Separate each section of the turning and glue together to form the various characters. Decorate with gloss enamels

by Ray J. Marran

AN INTERESTING and fascinating lathe project for junior home-craftsmen is the turing of small, novel and comical heads for bottle corks. The spindle stock may be pine, or maple, 1 to 1½ inches in diameter. The length of the heads vary from 1 to 2½ inches.

Shape the turning into balls and ovals to represent heads and shoulders. Hat shapes may be turned directly on the head, or turned separately, then attached to the head by cutting angular slices off the top of the heads so the hats can be glued on at jaunty angles.

Noses are represented by glueing tiny pieces of wood in the front of the faces as shown. Paint the faces flesh color, with black hair and black dots and lines to indicate eyes and mouth. The hats and the shoulders should be painted in bright colors. Use two coats of quick drying enamel to produce a high gloss. Glue the bottle corks to the bottom of the head ornaments with waterproof glue, or household cement.

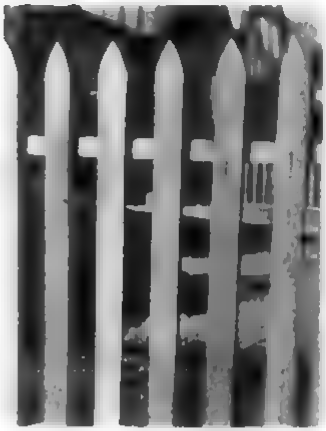
Depth Gauge For Hand Saws

WHEN making shelves, window frames and furniture it is often necessary to cut a number of joint notches to uniform depths. To insure all saw cuts being identical, scribe a series of lines along one side of the blade spaced about ¼-inch apart. A phonograph needle, inserted in a mechanical pencil, and drawn along a straight edge, will insure accurate markings.

Stony Top

A Miniature "mountain" made of small pieces of broken field stone will discourage dogs, cats and small boys from using the top of a brick or stone fence as a roosting place. The stones are merely set in a layer of mortar about three inches deep. One part of cement to three parts of fine sand will make a satisfactory mixture.

Rusty Pickets



Wooden pickets fastened in place with ordinary nails soon develop ugly rust streaks. To avoid this disfigurement, use blued lath nails, or, better still, thin flat head brass wood screws. The latter take more time to put in than nails, but they hold better, and, if countersunk, can be completely concealed by using small dabs of plastic wood.

First Aid To Glass Cutters

THE first and most important rule for successful glass cutting is: Never draw the cutter along a line already made, or across a line. A line hardly discernible will cause a break much cleaner than a heavy one, and it will be not nearly as damaging to the sharp edge of the cutter.

If a large piece of glass is to be reduced in size mark the size carefully by nicking the edges or touching with a pointed wax crayon. Lay your straight edge in place, put the cutter against it and make one stroke from one edge of the glass to the other. Now if you next turned the glass and made the other hair line, the glass cutter wheel would have a tiny nick in the blade where it crossed the first line. To prevent this, first break off the waste designated by the first hair line.

When a small piece of glass is used, the waste can be broken off easily with the hands.

Rubber Band Holds Bristles

THE bristles of a brush can be stiffened easily by fastening several rubber bands around them approximately one-half inch from the end for use as a stenciling brush. If a brush is not needed for painting purposes, it can be made into an excellent stenciling brush by cutting off all but approximately one-half inch of the bristles. When a painting job is completed, many persons are at a loss as to how to keep the brush soft and pliable until the next time it is needed. Keeping it in a can of water is satisfactory but somewhat cumbersome because of evaporation. If brushes are wrapped in wax paper and dipped in hot paraffin to seal in the moisture, they will remain in good condition for several months. If brushes are kept in good condition at all times, it will not be necessary to purchase new ones each time some painting must be done.

MM Short Wave

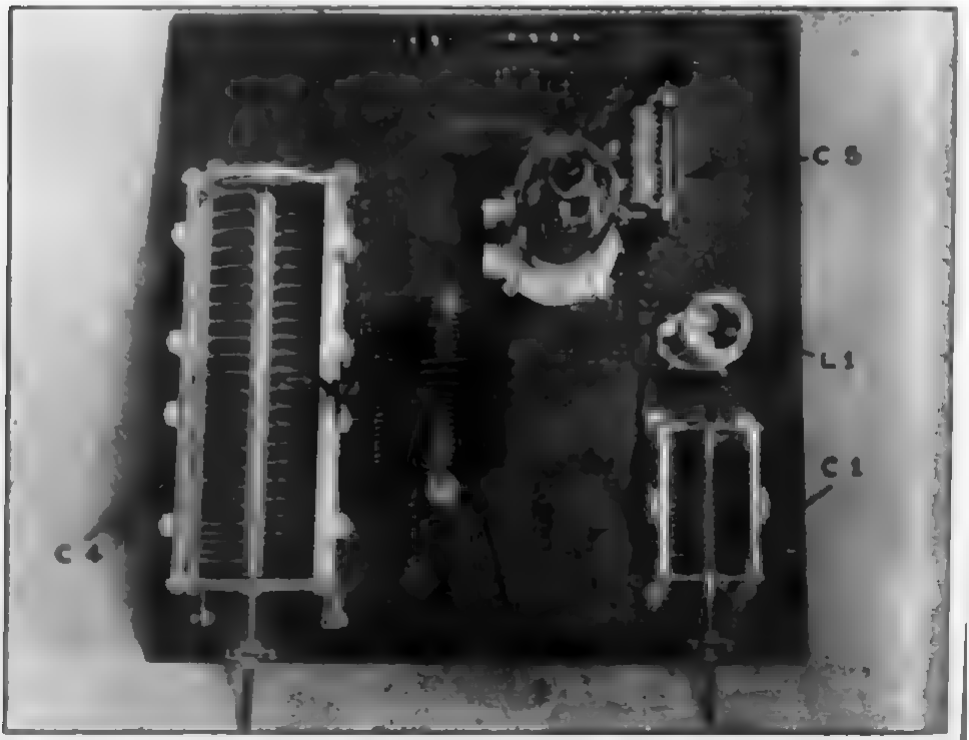
AT LEAST once in the life of every amateur comes a desire to go on high power, not necessarily with a "California Kilowatt," but with something in the 400 to 500-watt class. The amplifier about to be described, with 400 watts input, is intended for operation with the oscillator-buffer combination described in the February 1938 issue of MODERN MECHANIX

Using a T125 tube, this amplifier is easily constructed and its operation will be a pride and joy to those who build it. The T55 used in the buffer stage will give far more than enough excitation for the T125 and therefore is operated considerably below its rated maximum input. The power supply shown in this installment is capable of handling both the buffer and the final stages in the event the supply described last month was not constructed

The parts for the r.f. section are mounted on a piece of plywood eighteen inches square by one-quarter of an inch thick. The black paint used was made by dissolving pieces of an old phonograph record in alcohol. This paint not only dries very rapidly but has fair insulating qualities.

The filament transformer should be placed close to the connections on the baseboard to insure the filament against reduced voltage because of voltage drop in long leads. Because of this, the transformer is not shown in the picture of the power supply, having been mounted on the rack in which the transmitter is located

An 0-100 millimeter will give a good check on the rectified grid current in the final. According to manufacturer's specifications, the T125 grid current should not exceed sixty milliamperes. With the T55

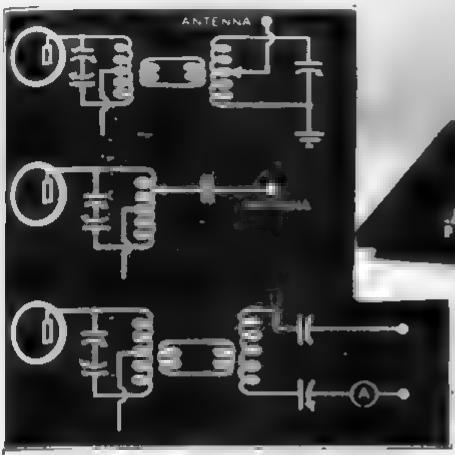


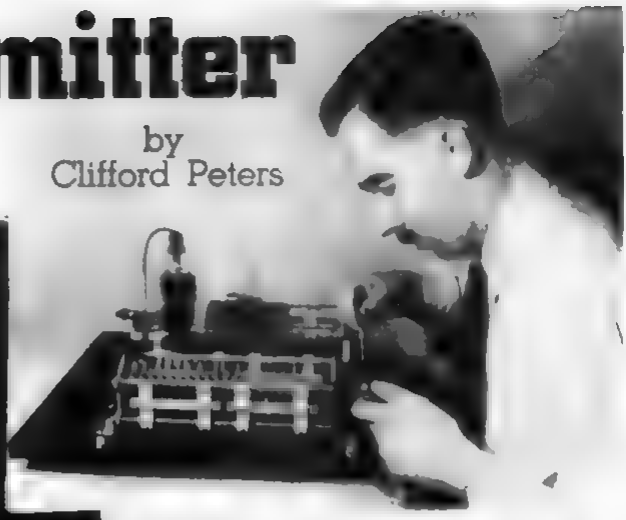
The turns of heavy wire around L2 are to couple tank coil to antenna tuning unit. Connections at the rear of the baseboard are for filament, plate, and fixed bias. The neutralizing condenser (C3) is of the split-stator type, series connections being used

Transmitter

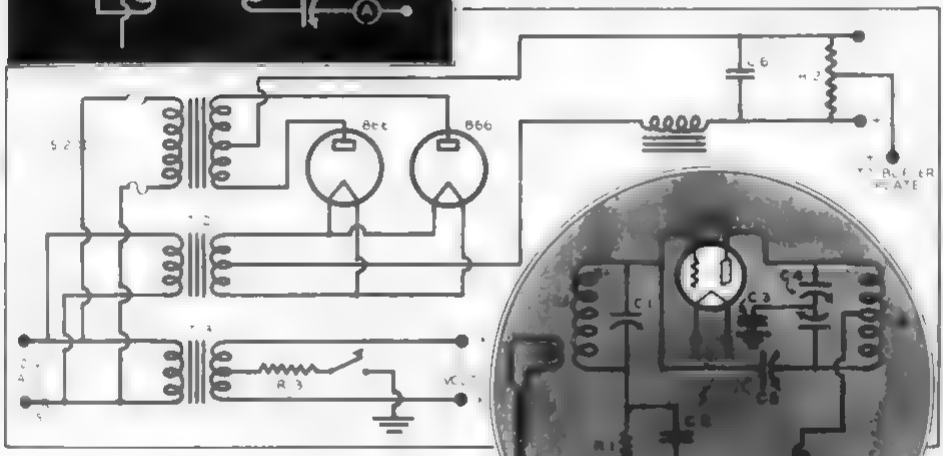
PART II

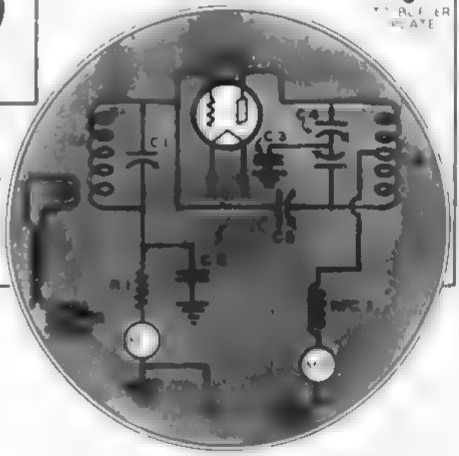
by
Clifford Peters





At the left are shown only three of the many possible methods of coupling the antenna to the tank coil. The power supply switches are arranged so that power cannot be applied to T1 until the switch for the filament transformer is closed.

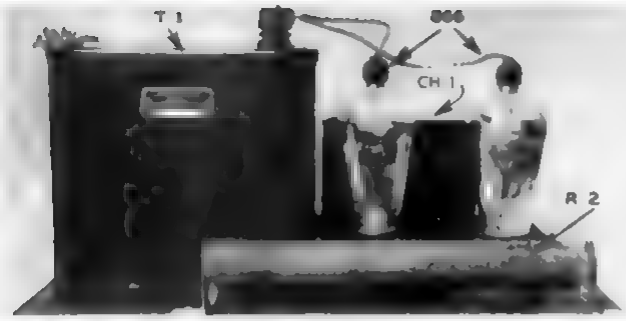




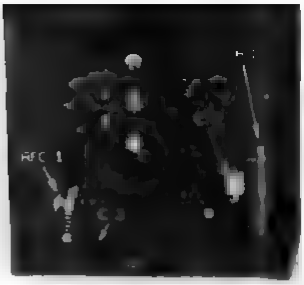
No fixed bias is shown in the diagram, but when plate modulation is used some provision should be made for keeping plate current down if excitation fails

Parts Required

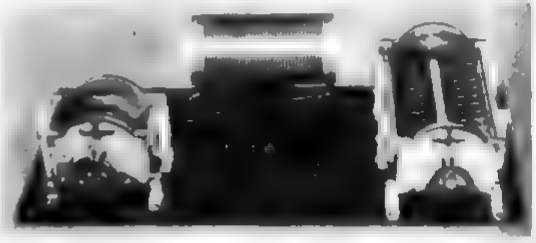
C1 .00015 mf. (Hammarlund MTC-150-B)
C2 .002 mf (Cornell-Dubilier 4-22020)
C3 .005 mf. 5,000-volt
C4 .000098 mf. (Hammarlund TCD-100-A)
C5 .000031 mf. (Hammarlund MCD-35-SX)
C6 2 mf 3,000 volt working
R1 4,000 ohms (IRC BP)
R2 100,000 ohms (IRC HOA)
R3 200 ohms (IRC BP)
T1 2360-0-2360 volts (Kenyon T-653)
T2 2.5 volts, 10 amperes (Kenyon T-360)
T3 10 volts, 4 amperes (Kenyon T-365)
Ch1 10 henry filter choke (Kenyon T-178)
RFC1 radio frequency choke (Hammarlund CH-500)
M1 Milliammeter 0-100
M2 Milliameter 0-300
Coil forms (Hammarlund SWF-4)
Flexible couplings (Hammarlund FC)
Three 4-prong sockets (Hammarlund S-4)
Antenna tuning condenser (Hammarlund TC-150-A)
Dials (ICA No. 2169)
Socket for T125 (ICA No. 956)
Fuse mounts (ICA No. 2342)
Insuloid rod (ICA No. 2175)
Insulated grid caps (ICA No 870)
S1, S2, toggle switches (ICA No. 1230)
Tubes: one Taylor T125, two Taylor 866
Stand-off insulators with jacks (ICA No. 2321)
Small stand-off insulators (ICA No. 2300 and 2301)
Insulex High-Voltage stand-off insulators (ICA No. 2338 and 2339)
Sub-panel stand-off insulators (ICA No. 2305 and 2306)
Terminal strips (ICA No. 2420 and 2413)
Miscellaneous bolts, nuts, screws, wire, etc. (ICA)



The filament transformer for the 866's and the filter condenser do not show in the photograph of the power supply, being mounted in the rear. This supply will handle both the buffer and the final with excellent regulation. During tests, the oscillator also was operated by the same supply with completely satisfactory results



Although in the photograph C3 appears to be connected to r.f. choke, this is not the case. It is connected to the small pass-through insulator



The antenna tuning unit. The parts are connected according to the tuning system selected and the antenna used. Exact dimensions of antenna coil will vary with individual conditions

operating anywhere near maximum input, the current will exceed this amount. Therefore, keep the input down so that the current remains near the thirty to thirty-five-milliampere mark for c.w. When plate modulation is used, the grid current should be increased to fifty milliamperes. This is one of the advantages of using a tube of greater output than actually is necessary. Many amateurs have known the time when a tube needed just a little more exitation than could be supplied without rebuilding. With this set, the problem is eliminated, because the buffer is ready to "give" at any time

One or two turns are used for link coupling the buffer tank to the T125 grid coil When C1 is adjusted to about one-quarter to one-third capacity, the correct grid current will be produced. The final is neutralized in the same manner as was described in the February issue of MODERN MECHANIX.

Do not apply full power to the plate until the point of resonance on the tank condenser (C4) is determined, and then only when a load is applied to the tank. Always use a dummy antenna during the tuning up period. Nothing is a greater nuisance to listeners than to hear some enterprising "ham" getting his rig on the air

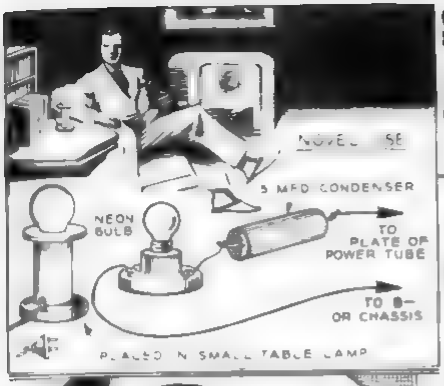
When the final is keyed, the resistor bias shown will be entirely satisfactory, but if oscillator keying is to be used, either battery or some other form of fixed bias must be provided to keep down the plate current when exitation fails. In this same classification belongs the warning that all power supplies should be fused, or an overload relay should be inserted in the circuit. Great will be the sorrow of the "ham" who loses tubes or a power supply just because he failed to exercise reasonable caution. An overload relay or a few fuses will prove to be the most valuable part of the rig when something goes wrong

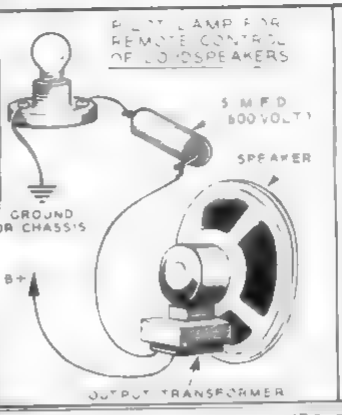
Several forms of antenna tuning systems are shown. The best one for any location will depend on the antenna used. For complete information on antennas, the builder is referred to he chapter on antennas in the "Radio Amateur's Handbook."

Because of the high voltages used in the final, and in the interests of safety, flexible couplings and insulated rods should be used for attaching the dials to the condensers This is good practice for any transmitter, regardless of the voltages used.

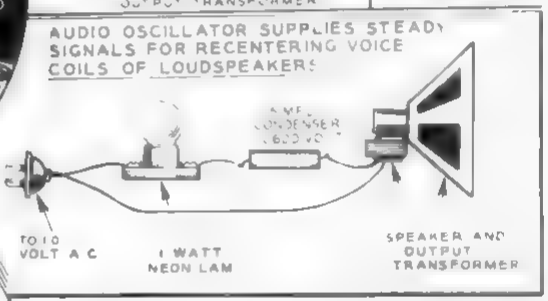
The grid coil should be of approximately the same dimensions as the buffer tank coil, that is, twenty-six turns on a four-prong plug-in coil form. For the 80-meter band, the tank coil has twenty-six turns of No. 12 enameled wire wound on a three-and-a-half-inch form. The winding should be spaced to measure four and a half inches This coil can be of the manufactured variety, or wound on one of the many forms available

Stunts With Neon Bulbs





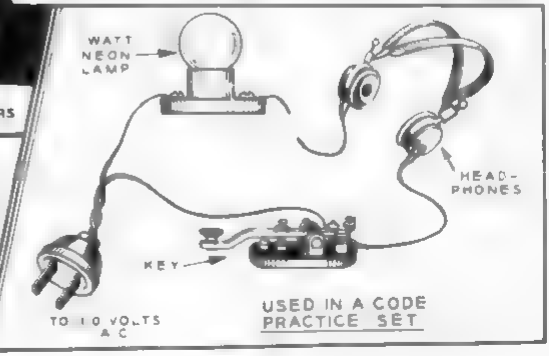
A ½ or 1-watt neon bulb and .5-mfd. condenser provides the necessary apparatus for performing these interesting stunts. At upper left is shown a novel decorative lamp converted into a radio tuning indicator. Simply replace the original bulb with the neon lamp, connect the .5-mfd condenser in series with one of the fixture cord wires, and attach to set as indicated. Left—A neon bulb and condenser connected in series with one lead of remote speaker serves as pilot light.



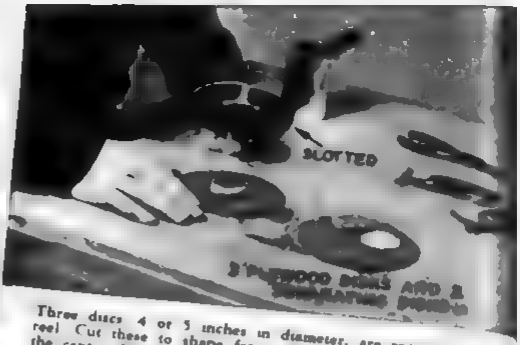
When recentering the voice coil of a dynamic speaker, so as to eliminate rattling noises, an audio signal is helpful in obtaining correct adjustment. Such a signal is provided by a neon bulb and a .5 mfd. condenser connected to 110 volts a.c. and to the dynamic speaker transformer primary lugs as shown above

The "talking" neon sign consists of several neon bulbs inserted in sockets attached to a wooden base. The sockets are wired in parallel to an extension cord which permits their connection to the output transformer primary of a radio set. Lettering is outlined on the bulbs with a china marking pencil and the background blocked out with black paint. The lamps will glow in varying intensities according to the pitch of the sound emitted by radio.

A quick and simple hook-up for a code practice set as shown below. Key, earphones and neon bulb are connected in series to a convenient 110-volt a.c. outlet. The key and the bulb are mounted on a plywood or Masonite board for convenient handling.



These handy rewind extension cord reels permit only the exact length of wire needed to be stretched on the floor. Their use not only adds life to the cord, but at the same time eliminates the unsightliness that often prevails when ordinary extensions are employed.



Three discs 4 or 5 inches in diameter, are required for each reel. Cut these to shape from plywood or pressed board, slot the center disc as shown and assemble on small wooden hubs.

Left—To prevent cord from kinking when it is wound on the reel, roller guides are used. These are mounted at the end of two brass strips which are pivoted to exact center of the reel. Make the rollers from ¼-inch brass tubing, cover with ⅛-inch rubber tubing and attach to strips with machine bolts.

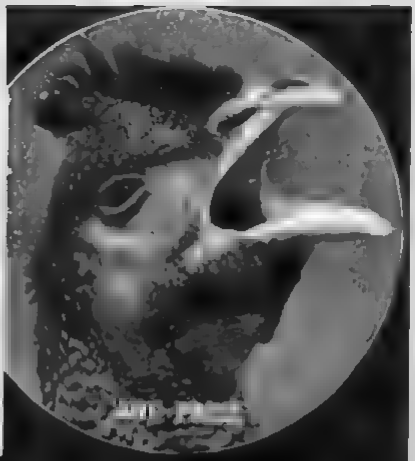
Spring Rewind Reels For Extension Cords

The fixture cord, which needs no special preparation, is doubled at the center, slipped through the rollers and inserted in the slotted center disc, as shown at left. By routing out the center of the middle disc and one hub, an alarm clock spring winder may be installed to provide an automatic rewind for the cord reel. Otherwise, reels can be wound by hand.

EXTENSION cords have a habit of getting tangled up and kinked, especially when they are rolled up or doubled up after use.

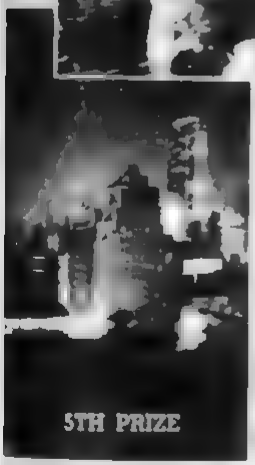
The reels illustrated will not only provide for quickly rolling up the cords when not in use, but, by eliminating kinks and tangles, will extend the life of the cords considerably. Two reels are illustrated, one of which is fitted with a clock spring to wind up the cord automatically. This reel is four inches in diameter and will hold ten feet of extension lamp cord. The other reel is five inches in diameter and holds twenty feet of cord.

The cords can be quickly attached or detached from the reels in the center and are wound up towards each end so that it is not necessary to unwind the entire cord when only part of it is needed.



MODERN MECHANIX PHOTOGRAPHY

SECTION
PAGES 103-114

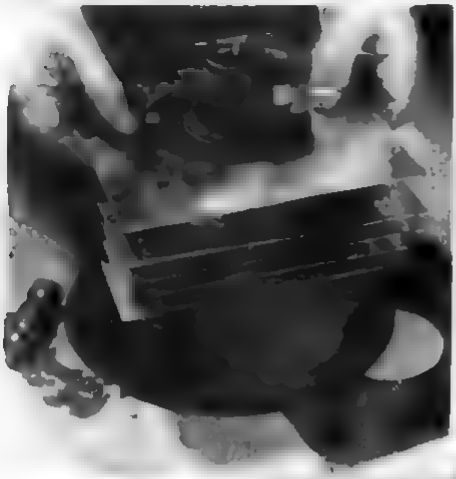


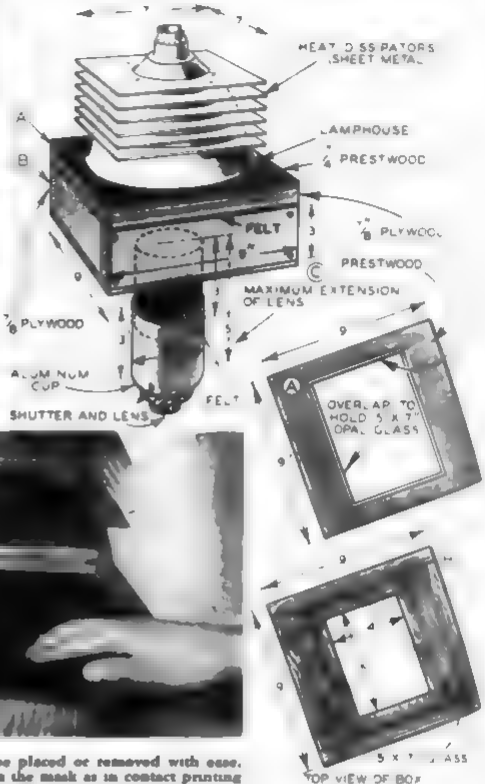
FIRST PRIZE—$15 — this month goes to George Yeter, of Provincetown, Mass., for his unusually well composed beach picture. The silhouetted rudder and the overturned rowboat make good "atmosphere." Avus camera, 3¼ x 4¼ Panatomic film, f. 22 at 1/100 second with green filter. **SECOND PRIZE—$10**—to William C. Gurtz, Sandusky, Ohio, for the intimate close-up of a hen's mouth. Mr. Gurtz' son heard the expression "scarcer than hen's teeth" [redacted] decided to investigate. Roll film camera, 2¼ x 3¼ Isopan film. **THIRD PRIZE—$5.00**—Clever use of composite photography by J. Allan Cameron, Moose Jaw, Sask. Simplex camera, Panatomic film, three separate exposures with 2 photo-flood bulbs. (See pages 108, 109, February issue of MODERN MECHANIX.) **FOURTH PRIZE—$5.00**—"Aw, Let Us Out!" Two appealing little pups caught by the Leic camera of Keith Swanson, Champaign, Ill., at 1/100 second at f. 6.3, Agfa Superpan film. **FIFTH PRIZE—$5.00**—Night pictures can be as interesting as sunshine shots. Part of New York's skyline caught by W. I. Roberts, 340 West 55th St., New York, with a Kodak 1A. Verichrome film, 8 minutes at f. 11. Camera was supported steadily during long exposure to eliminate movement.

MONEY FOR YOUR PICTURES

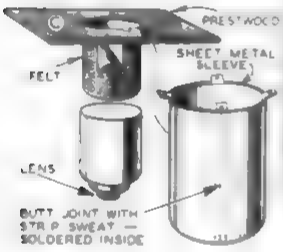
Get busy with your camera and send in unusual pictures of people, animals, machines, trains, airplanes, etc. Each month we will pay $15 for the best picture received from readers, $10 for the second choice, and $5 each for the next three selections. Prints should be glossy as large as possible up to 8x10 inches (although a small, clear photo is more desirable than a big fuzzy one) and should be accompanied by the following data: make and size of camera, type of film, and how developed and printed; lens opening and shutter speed; and lighting conditions. Wrap all prints carefully and include postage if you want them returned. Address all contributions to Photography Editor MODERN MECHANIX 1501 Broadway, New York N. Y.

The Modern Mechanix





Above—Six square sheet-metal heat dissipators are riveted to top of the lamphouse reflector



The negative may be placed or removed with ease, being merely laid on the mask as in contact printing (above). Left—Details of the lens focusing housing which telescopes over a felt-lined sheet metal tube. Right—Dimensions of the enlarger when designed especially for handling 9x12 cm negatives.

IF FOR economical reasons you wish to build an enlarger instead of purchasing one of the excellent manufactured jobs, do not expect that the homemade article need be less efficient and easy to operate. This one, in fact, has features and new departures that you will not find on any of the best domestic or foreign manufactured enlargers.

Consider this outstanding new development, for instance; the negative is inserted in identically the same manner as in contact printing! There is no wrestling with a negative holder or slide; no longer is it necessary to spend minutes jogging the negative about so that it is centered betwen two loose sheets of glass

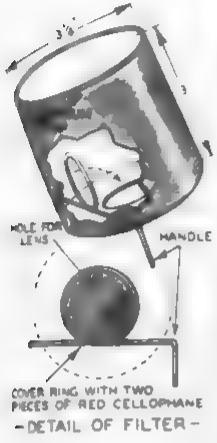
Illumination is provided by a brilliant photoflood lamp, which is controlled with a simple rheostat instead of the usual type which affords only a "bright" and a "dim" illumination range. This means that you can expose each negative for the same length of time, regardless of its density, by merely turning a knob. In addition, if you happen to have an electric exposure meter, you can test the light passed by each negative and bring it up to a given illumination by adjusting the rheostat, making exactly correct exposures possible every time. Heat from the photoflood lamp is adequately taken care of, not by ventilation but with a set of six sheet-metal heat dissipators attached to the lamp-house reflector.

There will be times when you will wish to make larger pictures than the baseboard will accommodate; in a split second, then, give

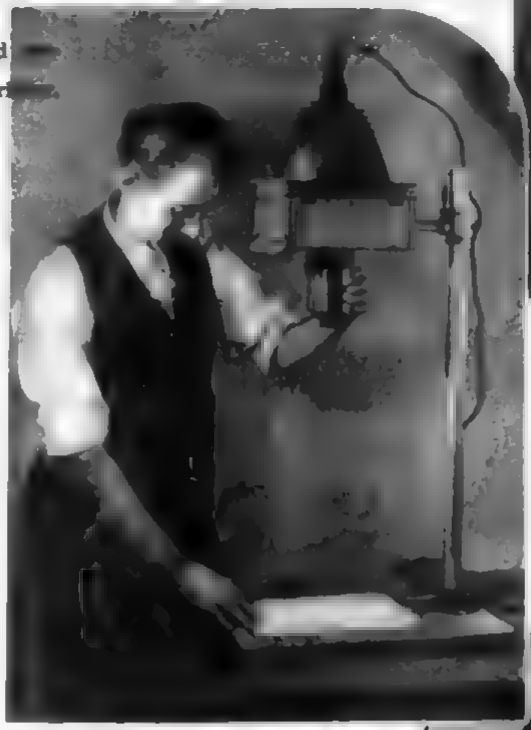
ENLARGER

by Kenneth Murray

An easy to build and ... nomical projection pri...



The sketch above shows the construction details of the simple red cellophane filter which is placed over the lens, by turning the wire handle, while the enlarging paper is being positioned on base board of enlarger



Above—How the counterweight is attached. The small pulley is set into a slot cut in top of the pipe. Left—Graceful in appearance, the MM enlarger has many features which make it stand out from ordinary projection printers. Simple in construction, there are no parts to wear or get out of order.

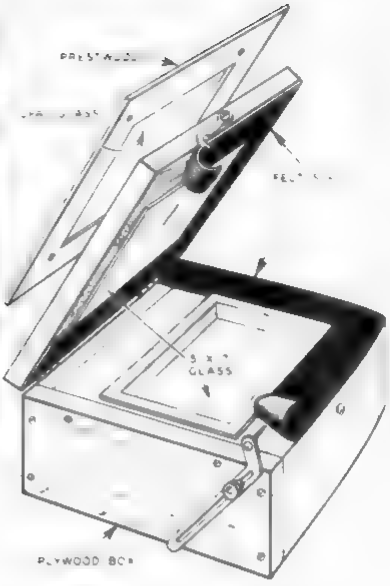
This sketch shows how to hook up a rheostat to control illumination provided by a photoflood lamp Circle—Uncovered rheostat, showing simple parts

the enlarger a quarter-turn and it is converted into a horizontal enlarger for projecting the negative to mammoth proportions on a sheet of sensitized paper pinned to a convenient wall. You will then find it an easy matter to make large photo-murals for wall decoration. Again, although the enlarger was designed for negatives up to the popular 9x12 cm size ($3\frac{1}{2}$x$4\frac{3}{4}$-inch), the dimensions are generous and when necessary it is possible to enlarge 9x12 cm sections of 5x7-inch and even 8x10-inch negatives without cutting them! This feature makes the enlarger truly universal in scope

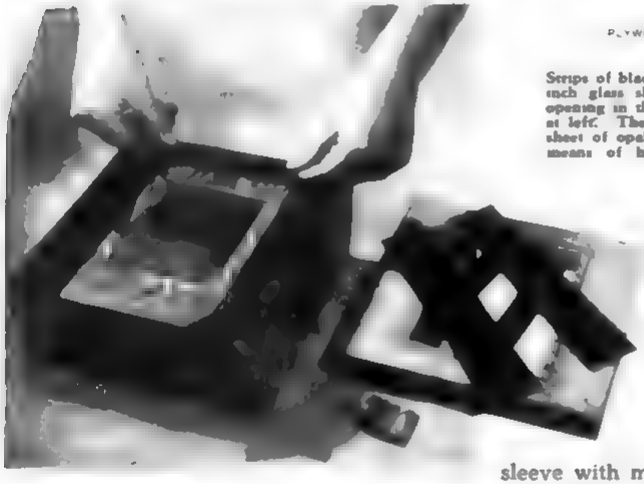
As the enlarger is counterbalanced, the use of heavier and more durable parts was favored in order to combine ruggedness with a complete absence of vibration. The latter is an important consideration of any projection printer if wire-sharp enlargements are to be made consistently.

The size of the baseboard depends on the size of the prints you wish to make. The pipe and fittings described here are intended for a baseboard size 14 by 18 inches, which is adequate for normal work and is not cumbersome. It was made of 5-ply wood, which was sanded, the corners slightly rounded, and varnished. Cleats on the bottom make it easier to screw or bolt the flange for the upright pipe support. Here is a list of the fittings you will need, including metal for the

A thumb screw set in the back of a galvanized iron tee clamps the projector to the upright iron pipe support at any desired height (above). The screw eye in the tee is for attaching the counterbalance rope. All parts are simple, but rugged.



Strips of black felt are cemented around the 5x7 inch glass sheets which are cemented over the opening in the plywood enlarger body, as shown at left. The lid of the enlarger is fitted with a sheet of opal glass and attached to the body by means of hinges, as shown in sketch above



heat dissipators; the cost, at a plumbing shop, was $1.22:

1	1″ galvanized iron pipe (31″ long)
1	1″ galvanized tee
1	½x3½″ galvanized nipple
1	½″ floor flange
1	1″ floor flange
6	7x7″ sheet metal

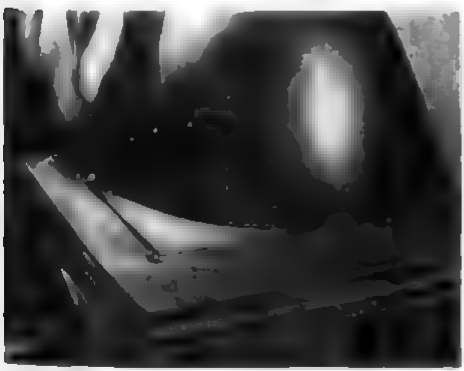
It will be necessary to drill or file out the larger threads in the tee so that it will slip easily, but with no excess play, over the 31-inch pipe. It is advisable to go over the latter with emery cloth to smooth it up nicely. Drill and thread a hole in the back of the tee for a ¼-inch (or larger) wing bolt, and make a smaller hole for a screw eye for attaching the counterbalance rope. The manner of assembling the fittings is shown clearly in one of the accompanying illustrations. A small brass pulley wheel is set into a slot filed in the top of the upright pipe, and the counterbalance weight is made by forming a tin sleeve that fits loosely inside the pipe, filling the sleeve with molten lead and setting a large screw eye into the top. If necessary a piece can later be cut from the lower end to regulate the weight or pull.

The body of the enlarger is made of 5-ply wood to form a 9-inch square, 3-inch deep box to which a plywood lid is hinged. Cut a 5x7-inch hole in the center of a 9-inch square of ¼-inch Prestwood, screw it to the lid, and in the latter cut a 4¾x6¾-inch hole, as illustrated. This leaves a ledge for a sheet of opal glass, which diffuses the light before it reaches the negative. A 5x7-inch piece of opal glass is preferable to a smaller size, so that the illumination will not fall off at the edge of the negative. With this construction even lighting is assured, and there will not be a "bright spot" in the center of the projected negative.

Four round-head screws, two of them with one side of each head filed away, hold the lamphouse to the hinged lid. The lamphouse itself is an ordinary shop-window reflector. Including the flange at the base, it has a diameter of 8 inches, and can be purchased at an electrical supply store for less than 50c.

Cut a 4x5-inch space in another piece of plywood and set it into the top of the box with screws. Two 5x7-inch sheets of clear glass are then cemented in place, one underneath the opening in the lid and the other over the 4x5-inch hole in the top of the box Use cellulose cement. As shown in the illustration, strips of heavy black felt are then cemented around the edges of the pieces of glass. After the lid and box have been hinged together you will find that the top, together with the lamphouse, can be lifted for placing the negative. A mask cut from thin black paper should be provided. In actual use, turn on the photoflood lamp and adjust the rheostat to a "dim" position, which will pass enough light through the negative and onto the baseboard so that you can readily move the former to exactly the desired position. Closing the lid will cause the negative to be sandwiched securely, and held perfectly flat, between the two sheets of glass

To the bottom of the box screw another 9-inch square of Prestwood, or thin plywood, with a round hole in the center to take a sleeve formed from heavy galvanized tin. The size of the sleeve will depend on the measurements of the aluminum cup which telescopes over it. The cup can be purchased at a department store for 10c and should have a diameter of not less than $3\frac{1}{4}$ inches, the handle being removed. Cover the outside of the metal sleeve with thick black felt. The fit between cup and sleeve should be rather tight. Cut a hole in the bottom of the cup into which the lens can be screwed.



The reflector is held in place with round-head screws which engage the flanged reflector rim.

Horizontal enlargements of great size can be made with the MM enlarger by merely giving the projector a quarter turn and projecting the negative to mammoth proportions on a sheet of sensitized paper pinned to a wall, facilitating photo-mural work.

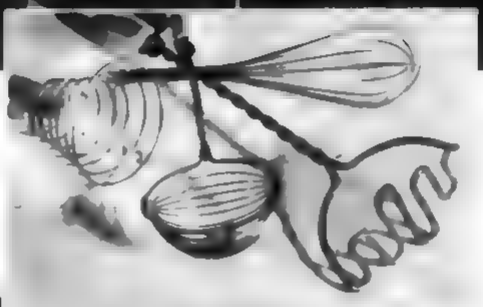
The lens should have a focal length of $5\frac{1}{4}$ inches, which is common for 9x12 cm cameras. If you do not already possess one, it is a good investment to purchase a used lens, which can be had for a few dollars Numbers of them are shown in the "used bargains" lists offered by the larger camera supply stores. While an anastigmat lens is of course preferable, the "R. R." type, or "rapid rectilinear," is a good and cheaper second choice. The construction of a built-in filter is shown in the drawing; it is used over the lens while the enlarging paper is being positioned on the baseboard.

The final operation in finishing the projection printer is to go over *all* inside parts and surfaces underneath the lamphouse with dead black paint. This includes the inside of the aluminum cup used for focusing, as well as the inside of the sleeve. If this is not done, internal light reflections will spoil the quality of your enlargements

This enlarger will turn out splendid work,

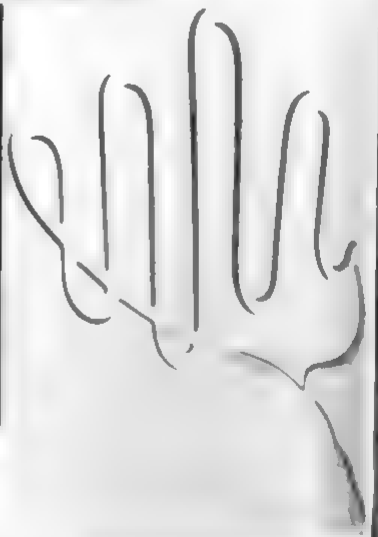
[*Continued on page* 128]

Striking photographic effects can be produced with kitchen utensils and glassware without the use of a camera. Two glass tumblers laid on a sheet of printing paper which was then exposed to light and developed in the usual way resulted in photo shown above



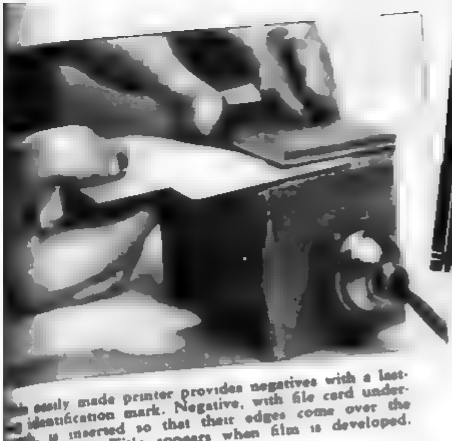
Cut glass placed on light sensitive paper and exposed by trial under a photoflood lamp provides many unusual effects At first glance the picture appears to be a photomicrograph of an insect wing. Actually it is a cut glass stem tumbler Left—Kitchen utensils such as these produce odd photo

This is not a negative of a tree branch, but a piece of parsley which was placed on a sheet of printing paper and exposed like an ordinary contact print. The picture at right is the result of placing a potato masher on a sheet of printing paper, exposing and developing it out.



Kitchen Photography

Electric Printer Titles Negatives



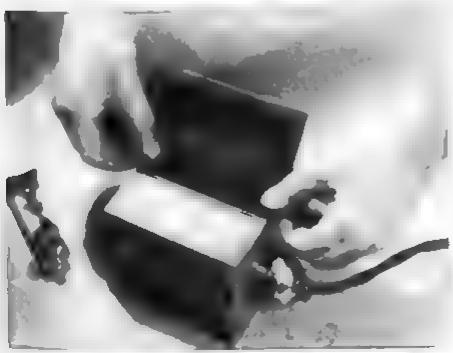
An easily made printer provides negatives with a last-minute identification mark. Negative, with file card underneath, is inserted so that their edges come over the exposure slot. Title appears when film is developed.

ONCE you have tried it, you will not wish to do without this method of marking your photo negatives. By simply writing or typing the title and negative number on the edge of a file card, the information is speedily and indelibly transferred to the edge of the undeveloped film. Additional data can then be added to the card, which is filed for future reference and as a quick method of locating the negative.

The device consists of a light-tight box built from ¼-inch pressed wood or plywood; the one in the illustration is 4 inches long, 3 inches high and 3 inches deep. Cut a hole for an ordinary lamp socket in one end. The 7½-watt lamp should be centered underneath a narrow slot which is cut in the top of the box for exposing the edge of the negative through the edge of the file card on which the data is typed.

To the top of the box hinge a 2 by 4-inch piece of pressed wood, which serves as a pressure plate. Cement a strip of black felt immediately back of the light slot, so that it serves as a stop for the negative and file card; cement another piece to the pressure plate so that when it is closed, the felt will hold the negative flat.

A 7½-watt frosted bulb, inserted in the socket at one end of the pressed wood printing box, provides adequate light for exposures. Below—A strip of black felt glued in back of the light slot serves as a stop for the negative and file card.



The marking operation is of course carried on in the darkroom, and it requires only a second or two for each negative. Holding the file card underneath the negative, place the edges of both over the light slot on the box; then, holding the pressure board down securely, give the key of the lamp socket a full turn. This will flash the light on momentarily for about 1/10 second, an exposure that is satisfactory for the average file card

[*Continued on page* 134]

HOLD THAT

Above—A good way to steady the camera is to lean against a wall. In circle—Photo A: taken indoors, 1/10 second at f. 4.5, with single light overhead. Right — Photo D: an interesting indoor shot, taken at 1/25 second at f. 8.

Above—Photo E: a "candid" picture, taken under poor light, 1/5 second at f. 4.5, with fast film. Pictures of this kind are valuable for the family album.

CAMERA instruction books and many articles in photographic magazines tell the beginner that it is not practicable to make exposures of less than 1/25 second with the camera held in the hands. For speeds lower than this, they say, it is necessary to put the camera on a tripod in order to obtain a picture free of fuzziness due to motion. In general this is good advice, as far as it goes, but it really isn't entirely complete

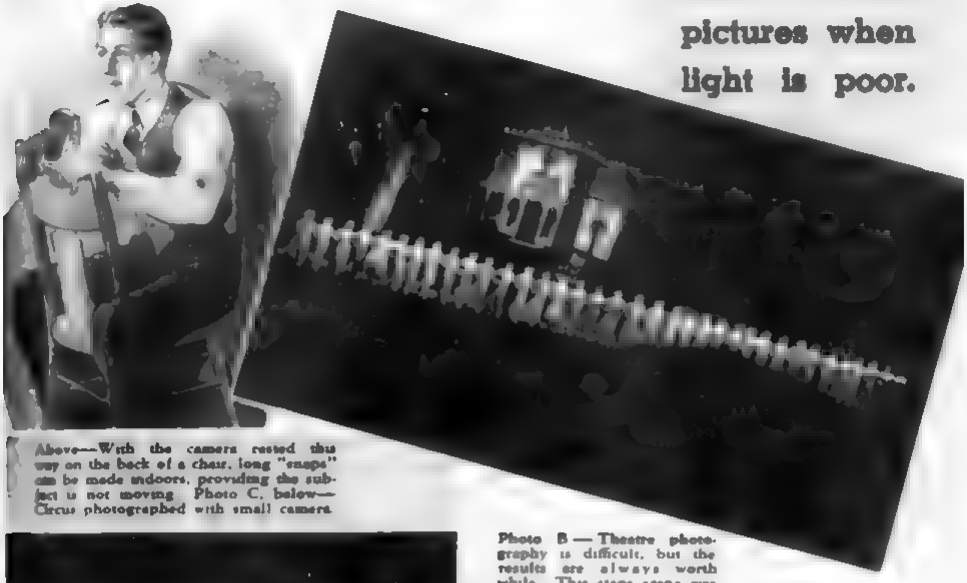
If the camera owner obeys these instructions implicitly he misses many chances to snap interesting and unusual pictures. Suppose the camera has an f. 4.5 lens, which is pretty much the standard on medium price cameras outside the expensive "miniature" class. If the light happens to be dull, an exposure of 1/25 second at the full opening of f. 4.5 will yield a weak and useless negative. Suppose you leave the lens at 4.5 but use a shutter speed of 1/5 second This gives FIVE times the exposure and certainly increases the possibility of getting a picture. Of course, 1/5 second will not stop any motion in the scene being photographed, and this must be taken into consideration However, you can ask people to sit still for just a moment, or you can choose a time when motion on the part of the subject is at a minimum.

Learning to hold the camera steadily for long "snaps" is easy. Simply grip the camera firmly in both hands, press it tightly against your cheek if it uses an eye level viewfinder or against your stomach if it has the look-into finder, take a breath, let only half of it out, and then press the shutter release. It is also important to press the release gently. Anybody who has done any target shooting and has practiced trigger "squeeze" finds camera shooting to be the same kind of game.

Many camera fans find that after a little steady practice they can make hand-held exposures of a full second without appreciable blurring of the picture. A second is a tremendously long exposure and produces good pictures under lighting conditions that

EXPOSURE!

How to make pictures when light is poor.



Above—With the camera rested this way on the back of a chair, long "snaps" can be made indoors, providing the subject is not moving. Photo C, below—Circus photographed with small camera.

Photo B — Theatre photography is difficult, but the results are always worth while. This stage scene was taken at 1 5 second at f 4.5, from the last row of seats.

appear absolutely hopeless. There are other little tricks. If possible, lean against a wall, post, fence, car, etc. In this way the danger of front or side swaying is done away with. Indoors, a favorite stunt is to straddle a chair backwards, resting the camera on its back. This is almost as good as a tripod. Some people tie a long string to the camera, loop the bottom under the foot, and push upward on the camera. This steadies it considerably. Special chains and tripod-screw fittings for this purpose are even sold as commercial items. An easily made hand grip that also helps under some circumstances consists merely of a short piece of broom stick or other round wood with the end turned down and threaded to go into the tripod socket.

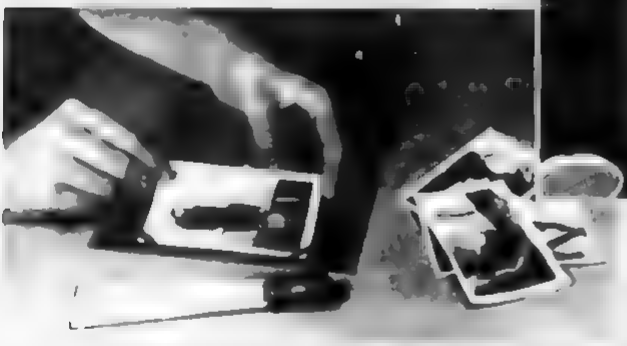
The shutters used on most good cameras have settings for 1 second, ½, ⅛, 1/10, 1 25, 1/50, 1/100, 1.200 and possibly 1.300, 1/400 and 1 500 second. The speeds of 1/25 and up are almost exclusively outdoor ones. Only on very dull days is it necessary to use anything slower with a 4.5 lens, and if the light is that weak the picture probably will be very flat and without contrast. The slower speeds will prove very successful indoors with artificial light, as provided either by the regular room lights or by photoflood lamps.

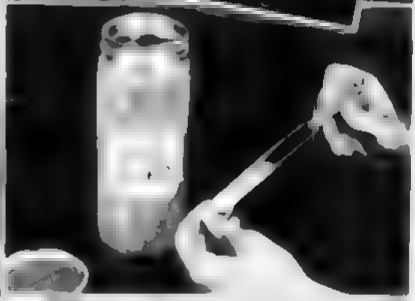
The principle in shooting indoors in uncertain light, if no reliable photo-cell type exposure meter is available, is to try two or three speeds with the lens wide open, and hope that at least one of them turns out to be satisfactory. Film is cheap and the only way

[*Continued on page* 136]

TIMESAVING TIPS for

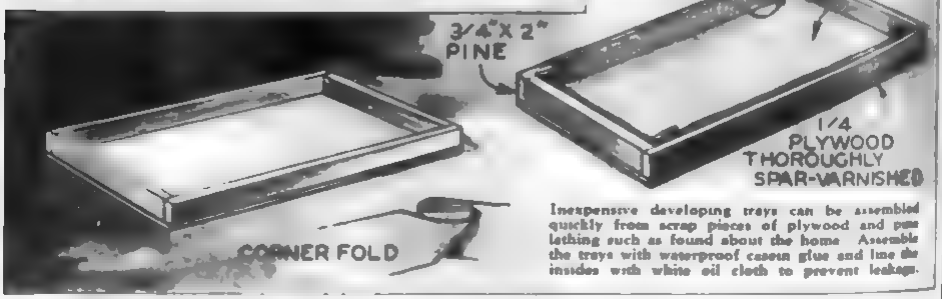
This flashgun was assembled from junk-box parts. The screw base from a flashlight bulb was soldered to the bottom of the socket and lead extended from short filament wire to socket terminals. To use, attach reflector and screw into a pocket flashlight. Right—A "dream effect" produced by means of a well-planned double exposured film





Cloudy hypo, no longer suitable for fixing purposes, can be used to give a silver plated appearance to articles of copper and brass. Clean metal well, immerse in hypo for 1 or 2 minutes, wash and finally polish with cloth.

Photographs can be mounted neatly in album without the use of special mounting corners or glue if the simple tool shown above is used. Consisting of a razor blade bolted to a thin strip of wood, it permits the album pages to be slotted quickly for inserting photos.



Inexpensive developing trays can be assembled quickly from scrap pieces of plywood and pine lathing such as found about the home. Assemble the trays with waterproof casein glue and line the insides with white oil cloth to prevent leakage.

PHOTOGRAPHY "FANS"

Photos can be titled attractively by masking out a corner of the negative and separately printing the title from a piece of clear celluloid on which the greeting has been written in black ink. [illegible] printing title, [illegible] out all but [illegible] underexposed [illegible]

An auto headlight dimmer switch and accelerator pedal mounted on a block of wood provides a unique foot-operated control for automatically turning on the enlarger light and turning out the safelamp, or vice versa. Wire up lights to switch as in drawing.

Unusual photographic effects can be produced by reversing the film image into a positive. By careful manipulation, negatives will reverse themselves if momentarily exposed to light about one minute after immersing in developer.

Electric Shutter Release For GRAFLEX

by E. S. Ensign

The remote controlled electric camera shutter release pictured at right is built around a relay salvaged from an old radio B battery eliminator. Details of construction are clearly shown in the upper schematic plan

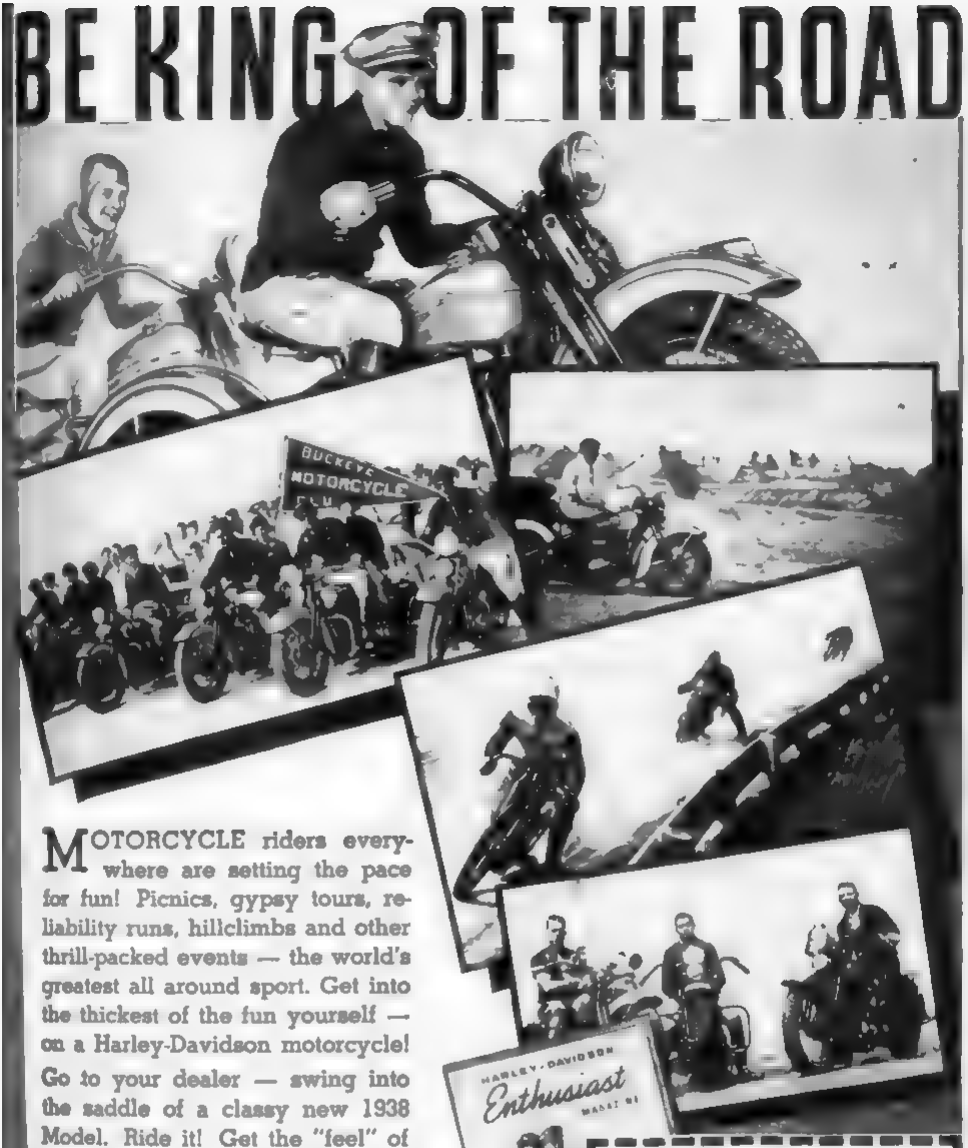
MOST amateur photographers, at some time or other, get the urge to try and take pictures of wild animals and birds. Here is an electric shutter release for your Graflex camera which will enable you to control the shutter from a distance. Its construction is simple and anyone who is handy with tools can make one along the same lines, either for the Graflex, or with alterations for most any other camera.

The principle of operation is clearly shown in the drawing and photograph, but the actual material used in constructing it will be governed entirely by the contents of your junk box. The electro-magnet shown in this assembly was salvaged from an old Yaxley "B" eliminator relay. It is very sensitive and one cell of a flashlight battery will actuate the armature even when connected to the magnet through 50 feet of No. 14 copper wire.

The various parts are assembled on a $\frac{1}{16}$-inch brass plate, 2½ by 2¾-inch. The complete device is fastened to the side of the Graflex with a thumb screw in the tripod socket bushing of the camera. Its position is then such that upon being released, the pin "F" strikes the shutter release of the camera, thereby exposing the film. The operation is practically instantaneous and much more positive than the method of using a long

[*Continued on page* 134]

BE KING OF THE ROAD



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UNSATISFACTORY NEGATIVES

I recently developed my first roll of film in accordance with the instructions in the November 1937 issue of MODERN MECHANIX. Some of the negatives on the roll came out almost charcoal black and others almost entirely clear. What is the cause of this?—G. Sanford, Flushing, N Y..

The "black" negatives are due simply to over-exposure and the clear ones to under-exposure during the taking of the pictures. To avoid repetitions of this occurrence, keep a careful record of all the pictures you take and then study the negatives after you develop them. In this way, you will soon be able to judge correct exposure.

RUINED PRINTS

About a year ago, I pasted up some enlargements on a piece of cardboard for framing. I find that the prints now seem to be deteriorating, parts of them being almost eaten away. How can I cure this trouble?—R. Foss, Lawrence, Mass.

It is too late to do anything about this now. The trouble is probably due to the chemical action of the paste on the photographic image. In mounting other prints, be sure to use paste made for photographic purposes. This is a regular item in stationery and photo supply stores.

DEFECTIVE SHUTTER

In taking some pictures of my dog, I tried a number of shutter speeds—1 25, 1 50 and 1 100 sec. However, they all seemed to be blurred, although I thought that the 1/100 sec. speed should be fast enough to stop the dog's motion. —G. E. Kent, Hollywood, Cal.

There should be a very definite difference between pictures taken at 1 25 and 1 100 sec. If there is not, the shutter on your camera probably is defective. As shutter mechanisms are extremely delicate, we recommend that you do not attempt to fix the camera yourself; instead, have it looked at by a man who specializes in this work. Any dealer in photo supplies will handle the repair for you.

USEFULNESS OF LENS SHADE

I read somewhere that a sun shade should be used on a camera lens when taking pictures in strong light. Is this really necessary as long as the sunshine is kept from striking the lens directly?—I. Miller, Atlanta, Ga.

A good light shade is one of the best investments a camera owner can make, regardless of the size or cost of his camera. It is valuable because it eliminates stray reflections that are not evident to the eye. In many cases, such a protective shade makes the difference between a clear, sharp picture and a peculiarly fogged one. It is an excellent idea to use a light shade for all pictures, regardless of lighting conditions. A shade is sometimes more necessary indoors than outdoors, as reflections from objects on nearby walls are likely to be very bad when bright lights such as photofloods are used.

[illegible]

The only space I have available for a darkroom is a corner of the cellar, about twenty feet from the nearest sink. I do not want to go to the expense of installing additional plumbing. Can you suggest any other arrangements for washing negatives and prints?—N. G. Barnard, Palisade, N. J.

Running water in the darkroom is a convenience, but not at all a necessity, as many people seem to think. It is needed really only for final washing operations, for which darkness is not essential or desirable. For rinsing your fingers, print tongs, tanks or trays, etc., a pail or two of water will be quite sufficient. After negatives or prints have been correctly fixed in the hypo bath, simply take them from the darkroom to the sink, where they can wash without need of attention watched.

WET FILMS

A roll of film from my camera was accidentally dropped into the water from a boat. I rescued it, but I thought it was ruined and threw it away. A friend of mine now tells me that I should not have done this. Is he right?—R. L. H. Chicago, Ill.

He is. Immersion in fresh water doesn't damage film at all. In fact, some photographers wet their negatives thoroughly before putting them into the developing bath.

PHOTOFLOOD CURRENT DRAIN

How many small size photoflood lamps is it safe to use at a time?—Sidney Elbert, Boston, Mass.

The small size photofloods, when used on 110 115 volts, draw about 250 watts. Individual lamp outlets in the home are not supposed to be loaded with more than 500 watts, so the safest arrangement is to use not more than two photofloods per unit. However, 3 or 4 bulbs may be used for short periods.

The life of the bulbs will be lengthened considerably, as the possibility of fuse-blowouts reduced, if photoflood bulbs are operated in series connections during focusing operations and then connected in parallel for full brilliancy only when the actual exposure is made. Double pole, double throw snap switches made for this purpose are a standard photographic item and can be purchased very cheaply.

REMOVING FILMS FROM PACKS

I sometimes take 3 or 4 pictures with my film pack camera and do not use it again for a few weeks. Is there any way of removing these exposed negatives so that they can be developed right away? It is quite a nuisance to wait until all 12 films in the pack have been used.—Kate Small, Pueblo, Colorado.

It is quite possible to remove exposed films from a regular 12-exposure pack. Of course, this must be done in a dark room. Merely pull off the head section of the pack, open the hinged tin body and remove the exposed films carefully, holding them by their edges. The head can then be replaced. This operation is practicable only with "chrome" type film packs, which can be handled under a red safelight. Panchromatic type packs can be handled only in complete darkness, and are therefore difficult to open.

MODERN MECHANIX AWARDS $40 EACH MONTH FOR BEST PHOTOS SUBMITTED BY READERS

The editors of Modern Mechanix distribute $40 in cash awards each month to the five persons who, in their opinion, submit the best pictures suitable for publication in the Modern Mechanix Photography section. Full particulars regarding these awards will be found in this issue on page 103.

Enjoy new thrills...develop new skill...
make Snapshots at Night

ALL YOU NEED

1

Your present camera loaded with Kodak "SS" Film

2

Two or three Photoflood lamps in Kodak Handy Reflectors

YOU'LL find snapshots at night almost as much fun as taking up photography all over again. Working out interesting picture situations, gauging distances, placing your subjects, arranging lights—you're an artist working with a new medium. Snapshots after dark aren't at all difficult—but they are interestingly different.

Equipment is simple. You don't need an expensive camera, not any more. Any camera that can be loaded with Kodak "SS" Film will do the trick—even the simplest Brownie.

With "SS" Film, you use two or three of the new No. 2 Mazda Photoflood lamps, which last for hours, and inexpensive Kodak Handy Reflectors. If your camera has an *f*.6.3 or faster lens, then the No. 1 Photoflood lamps are quite powerful enough.

FREE BOOKLET . . .

Suggests a variety of picture opportunities . . . shows you how to arrange your lights . . . how to place your subject . . . tells you everything you need to know about two ways to make night pictures . . . *snapshots* with Photoflood lamps, *time exposures* with Photoflash lamps. You can use Photoflash lamps each good for one picture . . . your camera can be set for "time."

The directions are simple and easy to understand. Pictures and diagrams help make everything clear. Be sure to get a free copy at your dealer's today . . . Eastman Kodak Co., Rochester, N. Y.

New Method Raises Treasure

[*Continued from page 37*]

entirely, and total or partial paralysis is the result. Hence bends.

The type of breathing gear used by Nohl avoids use of natural air, thus preventing all nitrogen from entering the lungs. Breathed instead is helium, a life-giving gas, pleasant to breath and odorless. To meet physical requirements, it is mixed with oxygen by the diver as he uses it.

Under pressure, helium is not only highly efficient but it does not escape through the lungs into the blood appreciably. In diving, nitrogen dopes the mind and body, while helium exhilarates like a tonic.

The two high-pressure steel tanks of the breathing gear, one for helium and the other for oxygen, each hold 2,000 pounds of pressure, and 25 cubic feet. This is sufficient to sustain a diver 23 hours.

Here's how he utilizes the pressure he carries to offset water pressure. For every 100 feet the diver descends, he must resist 42 pounds lateral water pressure against every square inch of his suit. The suit's area is roundly 3,000 square inches. Working on the *Lusitania* at 312 feet deep will subject the diver to 478,000 pounds of water pressure, or 136 pounds per square inch. It should prove still easier than the record-breaking depth which experienced 529,200 pounds of water pressure, or 176.4 pounds per square inch, at 420 feet.

In descending, to resist the increasing water pressure, the diver fills his suit with corresponding amounts of air pressure, by means of valves at his side. The descent is made gradually so that the body adjusts itself to the pressure. In the test dive, Nohl reached bottom 420 feet down in nine minutes, by which time 180 pounds per square inch were valved into his suit. At the same time, the same pressure was breathed to prevent crushing of the lungs.

As the water pressure decreases coming up, blasts of air are released by pushing an outlet valve on the helmet. In this way the air pressure within the suit is equalized with the lessening water pressure without. Otherwise the suit would inflate like a balloon and perhaps burst. The diver is constantly advised his depth by telephone. The pressure gauge before his face on the instrument panel of the helmet registers the air pressure.

Between the two opposing pressures at great depths Nohl's suit of ½" rubber is compressed to ⅛ inch. Interesting is the fact that divers breathing helium can return from the *Lusitania's* depth almost immediately without fatiguing periods of decompression. Because the body decompresses, or adjusts itself to changing pressures, much faster with helium, the decompression time for 312 feet is less than one hour.

This compares with U. S. Navy decompression time tables, which require six hours for 300 foot

[*Continued on page 124*]

Trees That Travel

[*Continued from page 68*]

covering around the ball need not be removed, as it soon rots. The trunks are held straight by means of well anchored wire guys and the experts see that there is plenty of fertilizer and water to tonic the newcomer through a critical period.

With due care most of these woodland veterans stand their radical changes of base amazingly well, and even exotic and unusual trees have been made to withstand their changes of site, thanks to engineering skill and modern transportation methods. A rare and costly Chinese Zelkova was found to be unsuitably placed in Union Square, Washington, D. C., as it had wound its roots about an enormous sewer and was pining for lack of nourishment. A new site in the Square was picked out for it and a trench dug from it to the position held by the tree. The roots were then protected in the standard way and the tree, ball and all, was slid along the trench to the new station without having been raised above the surface of the ground. A month was spent in the preparations and the actual moving required eleven hours. The tree was 68 feet high and with all its appendices weighed 105 tons, yet so quietly was the change made that probably its "spirit" never knew what had occurred.

Tree-moving concerns cope with all conditions. They extract huge trunks from the Canadian Rockies; transfer palms from the jungles of Cuba to the plazas of Havana; uproot the prickly cactus in the deserts of Arizona to implant it in Eastern botanical gardens, and convey the ghostlike Banyan tree with all its trailing branches and roots from the swamps of Florida to the conservatories of American millionaires.

When Dust Explodes

[*Continued from page 44*]

despite the utmost caution on the part of employes, this dust still becomes ignited.

Dr. Price formerly served in the Bureau of Mines and ran into the same kind of a public enemy there—dust explosions in coal mines. In this case, the danger was eliminated very largely by the simple trick of mixing non-combustible rock dust in with the combustible coal dust. The principle is the same as that on which Sir Humphry Davis based his famous miner's lamp. It works swell———in mines, but you can't mix other kinds of dust in with the dust of things you are going to eat—so the idea isn't worth much in dealing with grain and cocoa blasts.

Hylton R. Brown, one of Dr. Price's assistants and the secretary of the National Fire Prevention Association's committee on dust explosion hazards, has tackled the problem from another angle.

By excluding oxygen from the air in danger spots, the possibility of explosions can be elimi-

[*Continued on page 153*]

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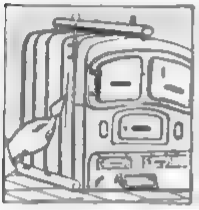
HOLDING onto money you already have is as good as making more that would have to be spent. You can easily save the amount indicated *or possibly much more* every year by making with Smooth-On No. 1, the repairs for which you otherwise employe a professional "fixer."


Stopping leaks

For instance, where a pipe, tank or water heater leaks, a heating boiler cracks, any kind of a pressure joint opens, a lock or hinge comes loose, screw threads or nuts strip, a handle won't stay on, or a leak or loose part appears on your car, you can usually make a perfect repair with Smooth-On at a cost of only a few cents for material, and no labor expense or delay.

Smooth-On hardens into solid metal, but is easily applied with the simplest of household tools and without heat or fire risk.

Judiciously made Smooth-On repairs are dependable and permanent, and usually make the performance of the repaired part fully equal to that of a renewal that would cost far more and in addition involve the labor of replacement. Even an emergency Smooth On repair will at least tide over until a permanent repair can be made with greater convenience and at lower cost.

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The free Smooth-On Repair Book gives complete instructions with diagrams for making the commonest household and auto repairs in the easiest and most effective way. Every "handy man" should have a copy of this booklet and a can of Smooth-On in his repair kit.

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A Jig Sawed Inlaid Lamp

[*Continued from page 71*]

inch less than the finished dimensions. This will save a lot of wood and unnecessary turning. When built up, the corners are planed off to make it eight sided on this thick part. You are now ready to glue on the inlaid blocks.

These blocks, eight in number, are ½-inch thick. To prepare them, take two pieces of wood a little wider than the flat faces on the post. One piece of walnut and the other of white wood are fastened together with several small nails. After the inlay design is drawn on the top piece they are ready to be sawed out. Taking the finest jig saw or scroll saw blade, the one made for cutting puzzles, saw through the two pieces on the lines marked out. Now remove the nails and interchange a piece of the dark wood for a corresponding part of the white. The inlay is now ready to fit on the post if the edges have been beveled first. The underneath face must be the same width as the flat face of the post. The angle for beveling will be 67½ degrees for an eight sided post. When the bevel has been completed and the inlaid block fits tight on the face of the post, it is glued on.

As each pair of blocks is sawed out, the parts are interchanged in the same manner, then fitted to the next one on the post and glued in place. When all eight have been glued on, the post, which is still eight sided but it is one-inch thicker, is ready to be turned. It is necessary in fitting the blocks to have the waves on one matching up, the waves on the next so there will be no jog in the resulting inlay.

Allow the glue plenty of time to dry, then put the post on the lathe and turn down just enough to get it round over the inlaid portion. The remainder can be turned to any shape desired.

After the base has been turned and glued on, the lamp is finished in the usual manner for inlaid work. The finish must be a clear varnish or lacquer so that the inlay will not be colored. Each coat should be rubbed down until the finish is smooth.

Various designs can be used for this type of inlaying. For a lamp with a ship motif as the one shown, a shade with ships adds a pleasing touch to the finished job.

Woman Is Wood Expert

[*Continued from page 64*]

stain. The organism was then "planted" on freshly cut uninfected wood of the same species as that containing the original stain. The same red discoloration was obtained, leaving Dr. Richards reasonably certain that the organism which causes this type of defect had been found.

Although Dr. Richards is not an entomologist, insects infesting wood are frequently sec-

[*Continued on page 153*]

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MORE SHAVING COMFORT FOR YOUR MONEY

The Car That Can Take It

[*Continued from page 60*]

up as much when it runs head into something as it would be if it dropped 13.4 feet? Most collisions are of the glancing blow type wherein the actual forces of impact are greatly lessened, and it is largely in this field that engineers hope to save motorists those endless bills for straightening fenders, repairing frames and aligning wheels. Most of the collisions also are with other vehicles rather than with immovable objects. That increases the force of impact and complicates matters still further. But the unbreakable car will come into existence because it is needed. It will take its place along with the fireproof office building and the dwelling that is immune to hurricanes.

Certain it is that the future will find cars wearing bumpers on all four sides. These would be ornamental as well as protective. They will be covered with special rubber bonded to the metal. It would not be surprising to find another continuous bumper running from the radiator bottom to the license plate holder over the hood and top. This would help protect the car in event of a forward upset, or roll.

These bumpers would be useful in concealing the radio antenna, and could also be used to carry fuel, water and oil for long distance travel. If the engine finally is mounted in the rear it may be the special continuous hollow bumper that will become the elongated gas tank. We are witnessing this year the first elongated battery box. It is suggestive of the new trend toward re-shaping many of the conventional parts of the car.

As developments proceed it will also be necessary for engineers to expand their work to make a car a safer place in which to be jostled about. It may even be necessary to strap in the driver and his passengers. Part of the security in the protected collision of tomorrow will be the importance of remaining in position during the impact and the possible after-roll. This is part of the secret of success with stunt drivers who manufacture their own collisions to demonstrate the strength of modern cars.

The Boeing Planes

[*Continued from page 54*]

powered low-wing monoplane was the forerunner of the later big Boeing bombers and commercial transports.

The next year, the Boeing twin-engined bomber appeared and it at once established the present trend in bombardment aircraft. Known as the Y1B-9, this all-metal low-wing monoplane was fitted with 600 h. p. air-cooled power plants, was streamlined throughout, and had a retractable landing gear.

The famous P26 low-wing monoplane pursuit

[*Continued on page 131*]

THOUGHTS HAVE WINGS

You Can Influence Others With Your Thinking!

TRY IT SOME TIME. Concentrate intently upon another person seated in a room with you, without his noticing it. Observe him gradually become restless and finally turn and look in your direction. Simple—yet it is a positive *demonstration* that thought generates a mental energy which can be projected from your mind to the consciousness of another. Do you realize how much of your success and happiness in life depend upon your influencing others? Is it not important to you to have others understand your point of view—to be receptive to your proposals?

Demonstrable Facts

How many times have you wished there were some way you could impress another favorably—*get across to him or her your ideas*? That thoughts can be transmitted, received, and understood by others is now scientifically demonstrable. The tales of miraculous accomplishments of mind by the ancients are now known to be fact—not fable. The method whereby these things can be *intentionally*, not accidentally, accomplished has been a secret long cherished by the Rosicrucians—one of the schools of ancient wisdom existing throughout the world. To thousands everywhere, for centuries, the Rosicrucians have privately taught this nearly-lost art of the practical use of mind power.

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The Rosicrucians (not a religious organization) invite you to explore the powers of your mind. Their sensible, simple suggestions have caused intelligent men and women to soar to new heights of accomplishment. *They will show* you how to use your natural forces and talents to do things you now think are beyond your ability. Use the coupon below and send for a copy of the fascinating sealed free book, "The Secret Heritage," which explains how you may receive this unique wisdom and benefit by its application to your daily affairs.

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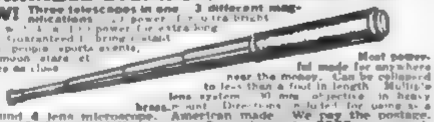
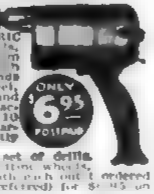


A Power Workshop in your hand



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New Method Raises Treasu

[Continued from page 118]

descents with natural air. While it has none 400 feet or more, it would presumably be e hours. Natural air took no diver deeper (306 feet, a previous record set in 1915 by F Crilley, a navy diver, who hooked hoisting ca to the sunken submarine F-4 on the botto Pearl Harbor, Hawaii.

To pierce the eternal darkness of unde depths, specially designed submarine searchli with multiple 5,000-watt bulbs of heavy g are being developed to aid Nohl in his sal work. Also are new types of acetylene b torches designed for underwater efficiency. torches will be equipped with high-pres oxygen blowers which will hold back the w while acetylene flames cut through steel.

Preparatory to salvaging the *Lusitania*, N and his crew will start operations on the *Me* in May. A ship equipped with sand-suck machinery will be employed to clear the r that washed into the wreck. Then the wa the safe will be clear. How the treasure is t recovered and lifted will be determined on job. By August, Nohl plans to be across Atlantic working on the *Lusitania*.

Revolutionizing the field of diving, helir equipped diving suits may succeed in salva other treasure-laden ships on which complic methods have failed. In the Klondike gold s *Islander*, sunk off Admiralty Island, near Jun Alaska, since she collided with an iceberg in 1 lies $3,000,000 in gold dust nuggets. Attempt drag the *Islander* ashore by lifting her with cables suspended from two ships, and float with the tide, were partially successful. T thousand feet from shore in 190 feet of water *Islander* broke in two. The forward half, c taining the valuable cargo, was again lost.

Untold millions in gold and silver are yet to recovered from the sunken fleet of Span galleons in Vigo Bay off the Spanish main. 1702 the fleet of 17 pirate ships were returni from a three-year loot on high seas. Homewa bound they encountered reprisal-seeking Brit warships and anticipating defeat, the pira scuttled eight of their fleet with a similar treas of gold that was recovered from the remain nine before they sank.

With helium equipment, salvage expediti at last have a fighting chance to regain the g glittering on the ocean floor.

Sponge rubber is being used like cement tree surgery to fill cavities.

A new farm machine invented in Russia is a bu harvester combine that pulls up beet roots a removes the earth and leaves clinging to them.

Red or yellow ocher mixed with road surfa material is a new safety idea, because the och makes the road somewhat luminous at night.

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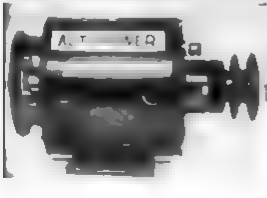

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How To Select And Use Axe

[Continued from page 77]

brushing out trails, spotting trees and odd camp chores, even guides regard a 1¾ pound tool as suitable.

Why buy a cheap axe when you can secure the best for as little as $3? Select your weight head carefully; the type, considering single-bitted axes is not as important, and you will likely have to take whatever is popular in your selection. Locality seems to govern the type of head used. For instance, in Maine we find a wedge-shaped head and in New Hampshire a modification of it. In Canada heads are somewhat similar to those used in Sweden, while the Hudson Bay Company has developed a special style for trapping and general woods work.

Check the steel around the edges of the "eye" of the axe. It should be an even thickness and in a straight line with the edge. A woodsman tests a head by inserting the handle in the eye, putting the wedge in lightly and then sighting along the edge to determine whether it is in line with the handle. He also likes the blade to "hang in" or be tipped down somewhat toward the handle.

Excessively hard steel in an axe chips out easily and cannot be sharpened with a file. To be right one should be able to file it, but not too easily. With today's tempering methods most heads are satisfactory, but not so handles. The professional woodsman will use nothing but a handmade helve, some of which are beautiful things, so flexible that they can actually be bent with the hands.

With a good tool and something to work on, first learn how to hold the axe. Stand with the feet 24 inches apart and toes pointed straight ahead. The handle should be grasped so the left hand is 3 inches from the end and the right, three quarters of the way to the head. To swing the axe, bring it up over the right shoulder until it is behind your back. Fix your eyes on the spot you intend to chop and bring the axe around and down in an easy movement, letting the right hand slide back to the left so that they touch at the moment the blade bites the wood. Now swing back over your shoulder and allow the hands to slide apart again on the upstroke. The opposite to this forward swing is known as the reverse. It is the same except that when the axe is over your head you turn sideways to drive the blow at the opposite angle to that of the forward swing.

To cut a log with these swings the expert stands on large timber to cut between his feet, but stands comfortably close behind logs a foot or less in diameter. Beginners usually cut the notches in segments, necessary to sever a log, too narrow. It is advisable to cut them rather wide, say 10 inches for a foot-thick log. First make a 50-degree cut with a forward swing, then a reverse cut and so on until the cuts meet, to take out a notch which should extend half-way through the log. It is then turned over and the cutting completed with a meeting notch from the other side.

[Continued on page 129]

New Invention WITH SUPERCHARGE PRINCIPLE SAVES GAS

NEW MOTOR LIFE · MORE PEP · 10 to 30% GAS SAVINGS · INSTANT STARTING · MORE POWER

AT LAST! Automotive engineers have smashed down the barriers to perfected combustion! The new VACU-MATIC creates the utmost of power. With almost [illegible] way. It gives the right [illegible] of gasoline [illegible] speed and [illegible] savings.

Automatic — Nothing Like It!

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Turn Out Good Glued Jobs

[*Continued from page* 94]

is unsurpassed for strength, and is easier than laying out dowel holes.

Often a craftsman will come upon gluing jobs which are hard to clamp up. Here is where long strips of rubber cut from old tire tubes comes in handy. The rubber is stretched tautly while being bound around the break; the multiple turns contributing considerable pressure. Many split tool handles can be repaired this way; hoes, rakes and brooms are examples. If the tool is exposed to moisture, the break should be bound with electric tape after the glue has set.

In the case of a broken rocker, it is best to replace with a new one, but if the stock from which to cut a matched rocker, as in the case of mahogany, black walnut, and the like, is not available, then the repair job shown on page 94 will be found quite satisfactory. If care is taken during the operations, the original finish of the rocker will not be impaired, and the repaired rocker will be stronger than ever. If desired, small wood-screws can be used instead of the dowels. Inlaying a strip of straight-grain hardwood, particularly maple, can be applied to many other repair jobs as well.

In preparing boiled cabinet glue, break the hard, raw glue into pieces not larger than silver dollars, and soak in tepid water for at least 12 hours. Then boil in a double boiler type glue-pot. If necessary, add boiling water to glue to bring it to consistency of beaten cream. Never add cold water to hot glue. Keep glue-pot covered when not actually in use. A small wood chip in the glue-pot may ruin a job.

If there is frequent, but intermittent, use for glue during the day, the "cozy" shown will be found valuable in keeping the gas or electric bill down. It consists simply of an asbestos-lined container which receives the glue-pot snugly. A pot of hot glue placed in the cozy will remain at working consistency for 5 hours, if no uncovered too frequently. Always beware of foreign matter falling into the glue-pot. It is good practice to occasionally thin out the glue with boiling water and strain it through cheese-cloth. A surprising amount of foreign matter will have found its way into the pot.

Modern Mechanix Enlarger

[*Continued from page* 107]

so take care to use the best quality of sensitized paper and the identical developer that is recommended by the manufacturer. The "P. M. C." enlarging bromide paper offered by one manufacturer, and the "Brovira" chloro-bromide paper made by another, are both economical and of good quality.

How To Select And Use Axe

[Continued from page 126]

Expert axemen deliver blows in series of three. The first of the series cuts into the top of the log, the second the bottom and the third, to take out the chip, in the center. Then follows a series of reverse blows to complete the notch. This method is less tiring because it prevents the axe from sticking, since the blade is never completely buried.

These forward and reverse strokes which produce what is known as a flying cut, suffice for 90 per cent of the sportsman's chopping. Others widen out the V-shaped notch on large logs, while a combination of an angle cut and a straight cut permits squaring off ends of logs as when getting out cabin timber. Some call this useful stroke a box cut.

Making a tree fall as you want it is not as difficult as it seems. Use its natural lean if at all possible. In any case, make a box cut on the side in the direction in which you wish it to fall, continuing until half-way through. Then on the other side directly opposite but just above, axe another cut until the tree warns it is about to fall.

Never stand directly behind falling trees, as they have an unpleasant habit of jumping back off their stumps with incredible swiftness. Avoid mishaps with your axe when cutting firewood, too. See that there are no interfering branches overhead and trim off limbs away from but never into the crotch. Have a solid log to work on, cut tiny small stuff at an angle instead of straight so that the ends will not fly in your face.

Even the best axeman does inferior work with a dull tool. Your new axe will have a factory edge, too dull for anything but splitting wood. For fine work, sharpen it on a grindstone, commencing 3 inches back and working forward to $\frac{3}{8}$-inch from the cutting edge. Finish off the last $\frac{1}{2}$ inch or less with a roll or bevel to leave a little extra steel there. This will permit the blade to bite deep but still prevent it from sticking and also enable you to keep the axe sharp with a common file. Always carry a file as part of your equipment and in using it be sure to work away from the edge. For very fine work have a pocket oil hone to mirror the edge after filing, and to touch it up after every few hours use.

Photographs Flame Cutting

High speed motion pictures of flame cutting have been made by H. R. Bullock of Massachusetts Institute of Technology. The pictures indicate that the oxygen stream of the oxyacetylene cutting process behaves very much like a stream of water from a faucet. The split second of contact between oxygen jet and steel was photographed. In the camera a prism rotating at high speed acted as a shutter and at the same time permitted continuous film motion. The film was exposed at the rate of 1,200 frames a second.

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Fun With Pocket Magic

[Continued from page 87]

the original key and then, under cover of the handkerchief, remove the looped key to the amazement of onlookers. Of course, switch the keys as soon as possible after the trick so that "A" is returned his own key.

[illegible] ritualism gave us a neat trick some years ago, [illegible] thing effect easily carried on one's person. [illegible] ing it, each wrist is tied securely to the ends of [illegible] gth of strong cord and the knots sealed with box. [illegible] then invited to examine an absolutely unpre- [illegible] metal, wood or glass, about 4 inches in [illegible]

[illegible] Me," you ask, "to pass this solid ring onto [illegible] my wrists without in [illegible] way cutting, un- [illegible] ving the cord or the ring?" It doesn't seem [illegible] by merely turning away for a split second, you can swing back with the unbroken ring hanging from the center of the cord.

The average time passing audience will spend many hours trying to work out this mystery, yet the secret is simple. Prior to performing the trick, slip a duplicate ring over your hand and onto the forearm, where it is held in place [illegible] cuffs of the coat sleeve. At the [illegible] necessary [illegible] [illegible] [illegible]

THE HIGHLIGHT OF 1938

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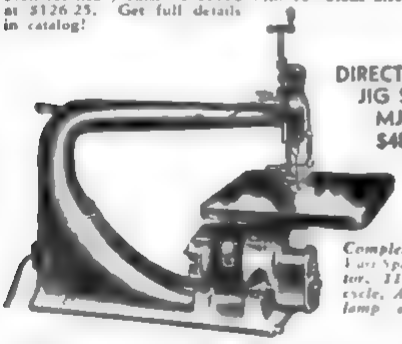

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DRIVER Engineered POWER TOOLS

Drafting Board For Workshop

[*Continued from page 79*]

solid post. Since only a little lumber enters into the construction, it is best to make the frame of good grade hardwood such as oak, maple, gum or mahogany. The drawing-board proper is a glued-up job of clear pine. For a de-luxe job, use sugar pine.

A particularly novel feature of this board is the cable operated straight-edge. Obviously the head of the common T-square would restrict its use on the upper part of the board. In any case, the mechanically operated straight-edge is preferable. The details of this are fully indicated. It will be seen that instead of using the usual small pulleys at the corners of the board, the operating cord passes through short lengths of U-shape tubing set into slots filed in the corners with a round file. After the tubes are in place the slots are filled up with plastic wood. The inside of the U-tubes are polished smooth with a soft cotton cord coated with oil and fine emery. The cord itself is hard-plaited, linen fish-line at least 32 lb. test. This is coated with vaseline and graphite, is led through the tubes as shown and is attached tautly between the washers on the No. 4 machine-screws at the ends of the straight-edge. One will find that a length of 16 gauge duraluminum 1½ inches wide that has been cut off on big machine shears makes an excellent straight-edge after its edges have been polished with fine emery cloth.

Airmail Stamps Are Popular

[*Continued from page 70*]

Newfoundland is the classic country for rare airmail stamps that tempt the collectors. The first air stamps of this British dominion have values of at least $2,000, and the issue so recently as 1930 bears a valuation of $500. These stamps are overprints, too, the first mentioned inscribed "First Trans-Atlantic Airpost April, 1919"; and the latter-mentioned here, "Trans-Atlantic Air Mail by M. B. Columbia, September, 1920."

The Newfoundland airmail stamp commemorative of that first flight of 1919, the 50-cent value of 1931, is an interesting adhesive, and has a catalog value of only $1.50.

Another interesting country for valuable stamps marking airmail flights, is the Philippine Islands. The Madrid-Manila flight was commemorated by an issue of 1926—overprints again—and range in value from $2.50 up to (as with the 16-cent stamp overprint) $175. These Philippine air-overprints are generally all worth preserving.

But now suppose that we turn to some of the lesser expensive airmail stamps. Many which appeared as late as 1930 are today rising in value. It is this "future" which seems to be attractive to stamp collectors. Probably next to United States postage issues, airmail stamps are the best bet

Accept No Substitutes! Always Insist on the Advertised Brand!

values. Even the 1933 Chinese airmails catalog between 20 and 80 cents today, only four years after they were issued.

Airmail stamps have marked, decidedly, man's trail blazing of, and conquest in the air; thus they are popular. When such stamps are also sound financially, as so many are, this additional advantage is an inducement to specialize in the field. Today, the French postage of 1926–27, overprinted for airmail usage in 1928, have risen astonishingly in price. The 10-franc overprint on the 90-centime adhesive is worth $50 unused in the standard catalog and postally used, $60. The 10-franc overprint on the 1.50-franc is cataloged at over $80 unused and higher, used at over a hundred dollars! These issues speak well for the used stamp.

Used airmail stamps often bear values substantially above the unused; this is particularly true of airmail covers marking "first flights" or "last flights." The letters carried, for example, on the ill-fated *Von Hindenburg* certainly are prizes in the aerophilatelic field. Covers carried by the Pacific Clippers across the Atlantic are by no means inexpensive, any more than will be the first flight covers carried by the Trans-Atlantic services which are being organized by the United States, England, and Germany.

We cannot forget the *Graf Zeppelin* airmail stamps, overprinted stamps, and covers, which that famous ship, its service now ceased, has carried. The *Zeppelin* issue of little Liechtenstein, for example, bears valuations of between $1 and $1.75; these stamps on covers would bring much more than that.

Hidden away, here and there, the stamp collector now and again comes upon a stamp or a cover which has not attracted too great attention. For instance, Lithuania issued a 60-cent rose airmail in 1924, (Scott No. 438) which is valued at $30. An error often makes the difference between an inexpensive issue and a rarity; let's look at an airmail stamp of Memel, 1921. It is the 60 pf. on 40-cent red and pale blue colored stamp. The issue was overprinted in dark blue "Flugpost," and the stamp in question (Cat. No. 306) is valued at a mere 50 cents. But the lucky collector to have that overprint, translated as "airpost," *inverted*, will find the valuation of the stamp jumping to $100.

Thus it is not difficult to understand why airmail stamps are popular. They often have attractive designs; they are issued for definite purposes which breathe adventure and they are generally good investments.

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[illegible]

Shutter Release For Grafle[illegible]

[*Continued from page 114*]

rubber tube and bulb, or a string tied to the shutter lever of the camera.

An extension "F" is formed of stiff sheet brass and fastened to the armature of the magnet. This engages the trigger "A" which is pivoted to the plate. The trigger holds the plunger "B" against the tension of the coil spring within the tube by means of the small brass plate "D" which is screwed to the end of the plunger. When current is applied to the magnet, the plunger is released causing it to fall and strike the shutter lever of the camera.

In making the release, first construct the plunger from a piece of brass tubing of the approximate size shown. Saw the slot for the steel pin "G" to slide in. The pin has the effect of compressing the coil spring in the tube when the plunger is raised, and it is also used in setting the device before exposure. Make two small washer-like bushings, one for each end of the tube. Their outer diameters should be a press fit within the ends of the tube and the center holes the same as the diameter of the plunger rod. This rod should slide freely in these holes when assembled. The plunger is a piece of ¼-inch brass rod, drilled for the steel pins as shown. These pins are also a press fit in the holes. The piece "D" is 1/16-inch brass and about ½-inch square, screwed on the end of the plunger with a 2x56 machine screw. The plunger and coil spring should be assembled together in the brass tube and the ends pressed in place and soldered. The tube is then soldered to the brass plate as in the details.

The trigger ("A") used in the release was taken from an old knife switch. However, one can easily be made from flat, sheet brass and pivoted to the brass plate with a machine screw. The magnet extension ("B") should be shaped to fit the particular magnet used.

An electric shutter release such as this opens new fields for the amateur. Pictures of wild life and self photographs are examples of pictures which it makes possible. It has the advantage of being very fast in operation so that the shutter can be released at the exact moment desired.

Printer Titles Negatives

[*Continued from page 109*]

made of thin stock. The identification line does not, of course, show until the negative is developed. Roll film can be marked in the same way, but leave the black paper backing in place as a guide so that you will know the location of each exposure. Bromide enlarging paper can be marked in the same way with about a one second exposure. A stronger lamp should be used if you wish to mark ordinary contact printing paper.

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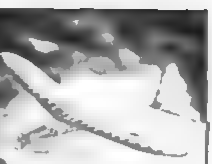

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Hold That Exposure!

[*Continued from page* 111]

to get results is to use plenty of it. If you expect to use your camera indoors, say during a party or a family dinner, load it with the fastest film you can buy. Many people stick to the "chrome" type films, which are all right for sunshine and the usual snaps of children at play in the park, swimmers at the beach, etc. Super-sensitive panchromatic film is almost THREE times faster in artificial light than the "chrome" type, and gives good results under conditions that spell complete failure for the latter. The new "super-super" panfilm is again about 50% faster than the super-sensitive kind, although it doesn't enlarge quite as well. This combination of fast film, a slow shutter speed, and a steady finger on the release button puts many a low priced camera into competition with $150 "candid" masterpieces.

The accompanying pictures give an idea as to what can be accomplished with an ordinary 2¼x3¼-inch roll film, folding camera, equipped with a regulation f. 4.5 lens and a compur shutter. Of course, these are the *successful* shots of perhaps six or eight rolls; the writer doesn't want to give the impression that the mere use of slow exposures solves all picture-taking problems.

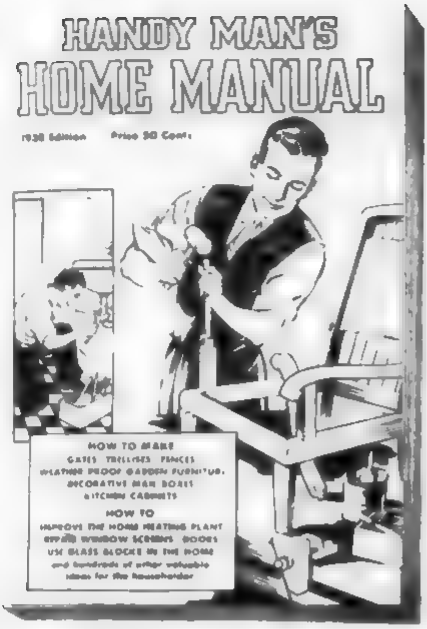
Photo *A* is of one of the popular penguins in the New York Aquarium, "walking the plank." Directly overhead there happened to be a large reflector with a bulb of perhaps 300 watts. Reflection from the water in the tank and from the white tile permitted a well timed picture at f. 4.5 at 1/10 second, with super-sensitive film. The camera was rested on the tank rail, and that undoubtedly helped a lot.

Photo B was taken from the last row of the Radio City Music Hall (New York), just as the chorus line-up stopped for a moment to catch its breath and enjoy a round of applause. That was 1/5 second, with the benefit of good white light on the stage. Incidentally, it might be mentioned that theatre photography is a waste of time if anything other than white light is used. The colored lights may look bright to the eye, but don't register much on the film.

Madison Square Garden during circus time is always good for many interesting pictures. Photo C was taken from the end of one of the upper balconies, with the camera held on a rail. This was a full second, with the lens closed down a bit to 6.3 to give depth of focus. This was a quiet minute between acts. The three rings and the two square platforms are clearly visible. The Garden is brightly lighted, and even a Box Brownie would give results here.

The silhouette of the monkeys, Photo D, was really accidental. The sky outside the animal house in the Central Park Zoo (New York) was bright and sunny, so the exposure was 1/25 second at f. 8. The monkeys show up mainly as shadows, but because of the pattern of the bars the picture itself is quite interesting.

[*Continued on page* 138]



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Craftwork From Halftones

[*Continued from page 84*]

medium, then fine emery cloth in the same manner. This will provide a satin finish which you may like to leave as is. If, however, a mirror-like polish is wanted, you must go two steps farther. First, with a large cork dipped in water and then in powdered pumice stone, rub the copper until all scratches are removed. Follow this with a similar cork dipped in machine oil and rotten stone. Ordinarily, polishing is the last operation, so as to remove tool marks and scratches, but if the finished piece is to be intricately sawed or assembled, a preliminary polishing will save much time afterward. A faster but less thorough way to polish the copper is with a coarse scratch wheel, followed by a fine scratch wheel and a cloth buffing wheel. The finished copper should be lacquered to prevent tarnishing.

A good way to color copper is to wipe the surface with a rag dampened with turpentine. Place the piece in a hot oven and allow to remain there until the resulting blue-orange color suits your fancy.

An antique coloring may be required by heating it to a dull red, allowing it to cool, and buffing the high spots to a polish. Unusual color effects may be obtained by giving the polished copper a cost of lacquer to which red, blue, or green aniline has been added.

To make the ash tray, illustrated, first cut out piece A then bend it into a triangular shape. Bend over the tabs and form a slight channel in each to prevent the cigarettes from rolling. Complete this part by soldering the corner. Using the bottom edge of it for a pattern, trace with a scratch-awl on two other pieces of copper, and saw them out as indicated. Solder the various parts together and finish by any method you like.

A few ideas for useful and beautiful things made from copper halftones, include sconces for wall decorations, coasters for the dining table, ash trays, picture frames, dishes, letter openers, rulers, name plates, keyhole inlays, fancy hinges, house numbers, monograms and many other useful articles.

Hold That Exposure!

[*Continued from page 136*]

Photo E is a genuine "candid" shot of a small boy trying his father's tools. Light came from a 100-watt lamp in a tin reflector over the workbench. The exposure of 1/2 second at f 4.5 left the shadow sections pretty dark, but at least a picture is recorded and it makes a valuable addition to the family album. A shot at 1 second was very much better exposed, but the chest is just a mass of movement. A speed of 1 second produced a negative too thin to be of any lights; it was a question of shooting right away

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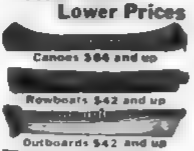

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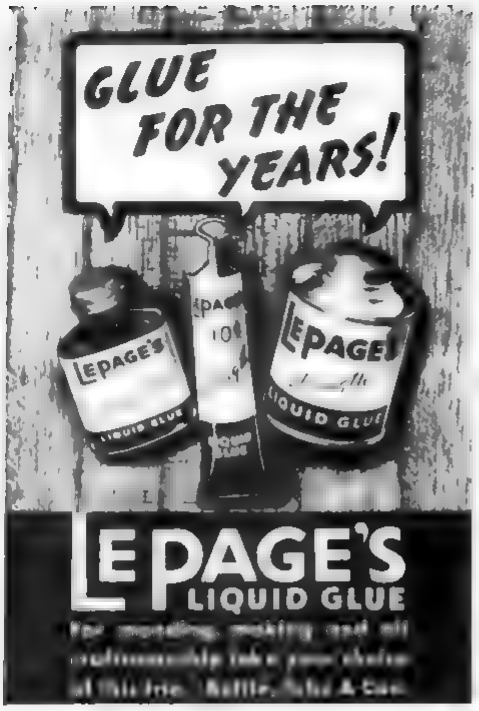


Fingerprint Mystery Cleared

[*Continued from page 140*]

second pair can be united with each of the first pair, the total possibilities for the first two pairs together are 4x4 or 16. Adding the four pairings of the third bracket gives 4x16 or 64 different combinations, while the fourth group makes the total 256 and the fifth pair 1,024, the number of primary divisions of the system of classification.

Assignment of arbitrary values to occurrences in this scheme enables the operator to express any given set of fingerprints as a single numerical fraction. Loops are counted as zero, whorls found in the first pair are put down at 16 each in the second pair 8, third pair 4, fourth pair 2 and fifth 1.

Supposing the formula in a particular example to be $\frac{W}{L}\ \frac{W}{L}\ \frac{L}{L}\ \frac{L}{L}\ \frac{W}{L}$. Transpose these symbols to numerals: $\frac{16}{0}\ \frac{8}{0}\ \frac{4}{0}\ \frac{2}{0}\ \frac{1}{0}$, which added give $\frac{25}{0}$. In order to avoid zeros as totals where loops alone are present, 1 is added to each part of the fraction, making our example $\frac{26}{1}$ and finally the whole fraction is inverted, giving in this case $\frac{1}{26}$ as the primary classification number, written as the first numeral on the card record, upper right corner, under the heading "F. P. C." (finger print classification.)

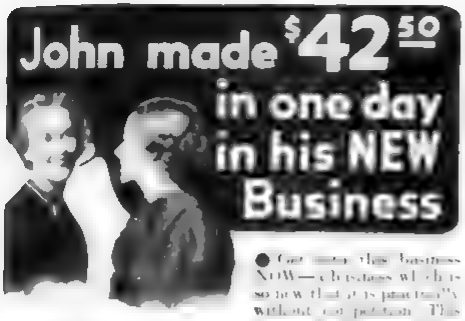
Certain of the fractions occur repeatedly and require subdivision. Since the class of loops includes arches, tended arches, ulnar loops and radial loops (A, TA, U, R), condition of the two index fingers expressed as a fraction gives a second number, $\frac{1}{R}$ for example, the right index finger being the numerator. The classification of our imaginary case now becomes $\frac{1}{26}\ \frac{1}{R}$.

Ridge tracing is the next resort. It will be noted that in loops and whorls there is a point toward the side and bottom of the print, at each side where a single ridge forks and diverges or where two parallel ridges diverge. One branch goes upward, the other down or straight across. The point is the *delta* and the lower limb of the fork from the left delta must either pass inside (I) meet (M) or pass below and outside (O) the lower limb from the right delta. The first three fingers of the right hand as numerator and first three of the left as denominator will provide another fractional expression, such as $\frac{I\ M\ O}{O\ M\ I}$. Thus augmented, our example reads $\frac{1}{26}\ \frac{I\ M\ O}{O\ M\ I}$.

Last comes *ridge counting*, used with the loop type only. Two termini are established, the outer being the delta on the side away from the slope of the loop; the radial delta on an ulnar loop and vice versa. The inner terminus, also called the *point of core*, is the apex of the central rod in the loop. If two parallel rods are central, connected at their tops, they constitute a staple. If not so connected they are imagined to be so and treated the same. Here the shoulder of the rod farthest from the delta is the point of core.

A ruler is then applied to the print and a fine line drawn connecting delta and point of core.

[*Continued on page 149*]



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Fingerprint Mystery Cleared

[*Continued from page 142*]

Using a magnifier and a sharp-pointed instrument as a tracer, the number of ridges crossed by this line is counted, excluding both termini. If a given ridge begins or ends abruptly it is counted if any part of it is crossed; should a ridge fork, no matter how closely to the line, the two branches are counted as two separate ridges if the line crosses them after forking. Arches and whorls are scored as zero.

This gives the designation *ridge count*, the numerals in each case being placed on the record card individually for each digit, in the upper right corner of the square containing the separate rolled print. Counts for the two little fingers, right one numerator and left denominator, provide the final increment in the general classification number. If the ridge count in our imaginary example should show 6 ridges crossed in tracing from delta to point of core in the right little finger and 15 for the left, the fraction $\frac{6}{15}$ is added to the previously determined series of values, giving a final classification number of $\frac{5}{28}\ \frac{V}{A}\ \frac{I}{I}\ \frac{U}{M}\ \frac{9}{I}\ \frac{6}{15}$ under which the card is actually filed.

These various details are too fine for determination without magnification. Prints may be analyzed with a hand lens, pocket magnifier, reading glass, binocular microscope or a special and inexpensive instrument known as a finger print reader. If your compound microscope permits very low magnification, as when equipped with a separable low power objective and (or) a projection ocular, it can be used by mounting cards on the stage and employing reflected light. Remember that the eyepiece makes a simple microscope when removed and held inverted.

Photomicrography is of great value in this work. While a special camera is required to secure pictures of latent fingerprints (the actual specimens left on smooth surfaces by contact with the hands, as on polished furniture), any ordinary outfit may be used to photograph prints on cards. Low power magnification is best, preferably with a micro-tessar lens affixed directly to the camera, and positive prints are then either enlarged or made as lantern slides for projection. Both methods are used in court procedure.

Many interesting studies and games can be devised, once the classification system is mastered. Make and classify sets of prints of your immediate circle of friends; then some evening when they are all assembled and you have left the room, one of them—identity unknown to you—makes an impression of any single digit upon some polished surface, as a table top or window pane. Dust this print with talcum powder—a step known as developing a latent print—jar the surface to remove excess powder, then study with a lens and see if you can tell which finger of which friend made the impression, consulting your card records! It's loads of fun and not difficult.

ADLETS FOR HOBBYISTS

(See regular classified section for rates and other information.)

STAMPS

SUPER-WONDER Packet offered, containing 60 different stamps from Afghanistan, Transjordania, North Borneo, Manchukuo, Sudan, Guadeloupe, Iraq, Sarawak, French and British Colonies, including natives, beasts, ships etc., all for only 5c to approval applicants. Big illustrated lists free. Kent Stamp Company, Box 87-Z (G. P. O.) Brooklyn, N. Y.

UNITED STATES Commemoratives, 25 varieties, cataloging $1, postfree 5c only, with requests for our Worldwide Pictorial approvals containing, Animals, Ships, Buildings, and Airs. Taylor Stamp Exchange, 6314 Greenwood, Chicago.

TWO SAMOAS! Issued when Independent Kingdom! High catalogue—PLUS thirty attractive pictorials, including new bicolored triangle—10c, with low-priced approvals. Economystamps, Box M1543, Hartford, (6) Connecticut.

DIAMOND Airpost Commemorative Issue Complete, Proletariat Portraits Complete, Dragon Stamp, with 117 additional, cataloging $3.00, only 10c. Friendly Filatelists, Box 4428M, Philadelphia, Penna.

NEW Rivera nude stamp! World's largest triangle! Congo, Sudan, South Seas, bicolors, pictorials and many others. Only 3c with approvals. Cactus Junior Approvals, Box 2870-D, Tucson, Arizona.

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DIAMOND Shaped Airmail Set, PLUS thirty attractive commemoratives, new issues, pictorials—10c with Double Premium Approvals. Tru-Value, Box M1412, Hartford, (6) Connecticut.

GIGANTIC Bhopal Triangle, Turks Caicos, $5 U. S., Caymans, genuine Baden. Everything 3c with approvals. Viking, 1-MM Hanson Place, Brooklyn, N. Y.

STAMPS! 100 diff. 3c; 500 diff. 35c; 1,000 diff. 90c! Illustrated Album (4000 spaces) 22c. Approvals sent. Tatham Stamp Co. (D9) Springfield, Mass.

UNITED STATES—45 different 10c; 75 different (many Commemoratives) 30c. Free 25 different with approvals. Enclose 3c. Sidenburg, Baroda, Mich.

BRITISH Colonies, 54 Different including Jubilees and Coronations 10c with approvals. Swedell, 3129 Garfield Ave., Minneapolis, Minn.

MINT Coronation—Jubilees—Diamond Airmail—Mozambique Giraffe. 10c with approvals. Richie, 930 Faxon, Memphis, Tenn.

MONTHLY Stamp Magazine, 6 months and 25 foreign stamps, 25c. American Stamp Journal, Cedar Rapids, Iowa.

FREE!!! New King George Set. Postage 3c. Roberts, 901T Fourth, Baycity, Michigan.

COINS

FREE: Foreign Coin, Banknote and Large Illustrated coin catalogue, for 4c postage. Approvals sent. Tatham Coinco, Springfield-9, Mass.

AUTOMOBILE PHOTOS

PHOTOGRAPHS, World's costliest, speediest, automobiles, Alfa Romeo, Rolls, Duesenberg, Isotta, Bugatti, Tatra, etc. $1.00 per dozen. Automobile Photos, Box 514, St. Cloud, Minnesota.

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Woman Is Wood Expert

[*Continued from page 120*]

to her. She has been called on to solve the riddle of pin holes made by powder post beetles in an heirloom chest of drawers. She has several times been called South to investigate building rots and blue stain control in lumber yards and she has done research in Canadian, New York, and Wisconsin paper mills.

Her help has been enlisted in work with airplane propellers, automobiles, boats, boxes, carpet sweepers, golf club heads, handles, lath, logs, paving blocks, piling, poles, roofing, shingles, sash, washing machines, and a host of other wood commodities. It remained for Dr. Richards to discover why boats built of cypress, supposedly a durable wood, decayed rather quickly. The reason, she ascertained, was because sapwood was used instead of the durable heartwood.

It was the World War which started Dr. Richards on her unusual career. Back in 1917 she came to the Forest Products Laboratory in Madison as an assistant, replacing a man who had joined the army. He was Paul Siggers, now of the New Orleans branch of the same department. For seven years she remained the only woman in the department, but now two other women, Dr. Caroline Rumbold, working on blue stain organisms, and Mae Spradling Chidester, whose study is the physiology of molds and wood destroying fungi, are also in her department.

Dr. Richards has come a long way, and so has the knowledge which the government offers the public in this service, since she started as a teacher in the public schools of her home town, St. Mary's, Ohio, upon graduation from high school. After three years of teaching she entered Miami University, Oxford, Ohio, to take her bachelor and master's degrees in 1912 and 1914 respectively. Between 1914 and 1915 she was research assistant for the Ohio Biological Survey at Miami, before attending the University of Wisconsin to complete work for her doctor's degree in botany. Today, as head of her department, Dr. Richards and her work are internationally known.

When Dust Explodes

[*Continued from page 118*]

nated. To get rid of the oxygen, you merely extend the exhaust pipe from an engine into the place, and let the carbon monoxide drive it out.

Dust can't blow up without oxygen, but human beings can't live without it either, so the application of this idea is confined to places in which it is not necessary for men to work—a very serious limitation.

There remains a third method of attack: By reducing the resistance which the flame encounters when it begins to zip through the dust. In other words, let it explode but keep it from doing any serious damage.

This was the idea of the designer of the suspended elevator roof—which didn't work out in Omaha, but which has proven worthwhile in many other cases. Light plate glass windows, for instance, have been recommended for dusty places. And often explosions have blown out such windows and done little other damage.

Much to the scientists' annoyance, many of the most disastrous blasts in recent years have occurred in buildings which were constructed with the utmost care and attention to safety factors. The one which killed seven men in St. Louis in May, 1934, was in a modern, fire-resistant, 4,000,000-bushel, terminal elevator. The grain elevator in Omaha was only three years old when it blew up.

Every year the toll mounts, more than 600 such explosions now being on record in this country, involving a loss of nearly 500 lives and nearly 50 million dollars worth of property.

The Boeing Planes

[*Continued from page 131*]

ternally braced high wing monoplane types of all-metal construction and will have a high speed of around 200 m. p. h. The craft will ride the water during the takeoff and landing on short stub-wing hydro stabilizers instead of on the conventional wing tip floats.

These flying boats will be the first to have two full decks. The upper deck will house an elaborate control cabin, crew's quarters, and baggage compartment, while the lower deck will contain day and night passenger accommodations, lavatories, and dressing rooms. Passageways will extend through the wings to the engine nacelles to permit inspection and servicing of the engines during flight. Provision will be made for the highest degree of passenger comfort during long ocean flights.

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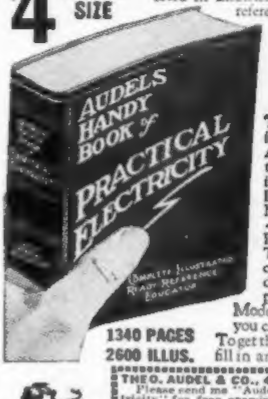

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A pocket screwdriver that carries its own illumination. The handle is hollow and holds a single "pen light" size battery and tiny bulb which shines downward along screwdriver blade.

"Cellu-linen" which eliminates the laundry problem. Pillow cases, table cloths, napkins, hand towels and dish cloths after use are thrown away.

A line squaring device designed for use by engineers, contractors, draftsmen, and architects.

A five by six-inch sun shelf for supporting flower pots is instantly installed on center sash of window.

A non-skid floor finish that is applied like wax, looks like wax, dries within a few minutes and resists boiling water.

A device to conserve alcohol usually lost by evaporation from the radiator of a car. Also it eliminates the objectionable odor noticeable when alcohol is evaporating.

A light-weight outboard engine capable of full speed cruising for three hours on one filling of tank.

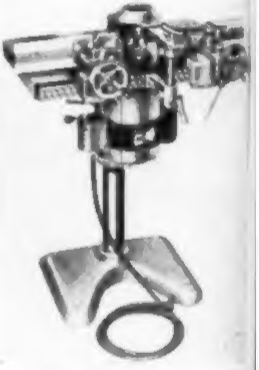
A bicycle tail light giving protection against accidents. Conforms with the requirements of the National Safety Council.

A device which automatically maintains the correct volume of air in furnaces using an automatic coal burner.

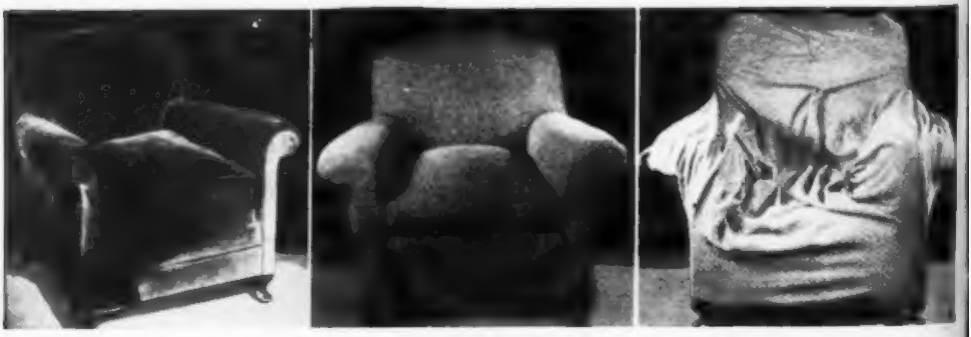
A vacuum radiator pump for use on air-bound radiators.

A lighting system for trailers can be used on either six volts or 110 volts. Either service can be used instantly with but one lamp and one fixture.

A support for radio chassis while the set is under repairs. Will hold any size or shape chassis and leaves it free to be moved without interfering with the leads.



A spindle shaper using geared motor drive. Spindle is turned at 7,600 r. p. m. by built-in gears.



Old chairs of any size are quickly made to look like new by using this elastic slip-cover, which can be fitted in place in less than five minutes without the necessity of cutting the material. Containing no rubber, it is made of rayon and cotton.